

Zephyr - Fall 2021 / Spring 2022 projects

Links:

- *This document:* https://drive.google.com/file/d/1U5LMQc9N3KGZ6XucCTmTUGLCPz40_uGa/view?usp=sharing
- [Zephyr - Boat Tour and Fall 2020 projects](#)
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ELECTRICAL

I decided to tackle a number of electrical updates:

- Battery
- Solar
- Fuse panel and other wiring around the battery area
- Breaker panel wiring
- Lighting
- Charger outlets

A few of the resources I used when planning include:

- Boat Electrics 101 from Boat How To – from Nigel Calder paired up with a couple of people to offer a video based course: <https://boathowto.com/boat-electrics-101/>
- Books by Nigel Calder and Don Casey
- [Pacific Yacht Systems](#) and associated [YouTube channel](#)
- [Explorist.life](#) and associated [YouTube channel](#)

My project exceeds my needs but I learned a lot and happy with how it turned out. I'll be able to report back more with experience over the years.

Battery – I decided to replace my two group 27 flooded lead acid battery with a single 100 amp hour Lithium Iron Phosphate (LiFePO4) battery from Renogy. It has a UL 1642 certification. It can handle the electric start on my outboard, the motor lift winch, and any house loads. I got the Bluetooth broadcaster so I can monitor the net load/draw on the battery and availability compared to capacity. Since LiFePO4 maintain a fairly constant voltage until close to depletion, simply measuring voltage is insufficient to indicate remaining capacity. I also installed a battery monitor with a shunt so I can also use that to see current draw. I got a new charger with a lithium profile.

I added a 30 watt Renogy solar panel that mounts above the stern pulpit. It easily disconnects using MC4 connectors. The wiring goes through an existing hole for cabling in the stern. I used fish tape to run the wiring under the cockpit sole alongside the existing wiring that travel that path. The solar panel is on a mount that I can easily disconnect and fold up for stowage. I rewired the original 10 watt panels to be in series. The new 30 watt panel goes to a solar shutoff breaker and then to a Renogy solar controller which then goes to bus bars. The original 10 panels go to a separate solar shutoff breaker, a separate Renogy solar controller and then to the bus bars.

I added some additional modular overcurrent protection. There's a MRBF terminal fuse block at the positive battery post, which then runs to an overall breaker so everything can easily be shut off. From there, it splits:

- to a smaller breaker for the wiring that runs aft to the motor and lift, so that can be shut off independently
- to the positive bus bar which then goes to a fuse block. From that fuse block, it goes to the wiring over the galley. I installed another inline breaker so that can be easily shutoff. There's a few other items connected to the fuse block by the battery such as the bilge pump (I reran the wiring so all the wires are hidden instead of showing on the cabin sole), a new circuit described below for lighting and charging.

I removed the old battery box. I made a box for the new battery, and this has barrel bolts which secure the battery to a large mounting system for other electrical gear. I made all of this as a unit and did most of the wiring before putting it in the boat. To remove the battery each season, I can simple unhook the positive and negative, undo the barrel bolts and pull it out. Everything else remains in place. The battery has a feature where you can put it back into into a stable "shelf mode"

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for off season when it is not in use. Above the battery I made a removable shelf where I can put the charger, extra fuses, multimeters, etc.

To make it easy to access this area, I drilled a hole towards the aft portion of the wood cover so I can use it to pick up that section. I also added fold down legs that are notched to rest on the shelf ledge. These fold up underneath for stowage using barrel bolts to stay in place. I did the same thing over the water storage on the starboard side. For the cover over the electrical, I mounted a battery powered LED light and I also mounted a thermometer (which broadcasts to an app via bluetooth) so I can monitor temperature.

I made several lighting updates and charging updates. The wiring for the light on the bulkhead by the head had been commandeered by a fan mounted on the mast step compression post, so I installed a junction box, then replaced the light with an LED light and tidied up the wiring to the fan. Since that junction box setup worked well, I decided to run a new circuit to a junction box mounted on the port side up by the trim alongside the v-berth that covers the hull to deck joint. In that junction box, I added USB 3.0 chargers, a lighter outlet, and wired in an LED strip that goes around the v-berth. Since that worked well, I took a similar approach to replace the light on the aft port side of the cabin with a new LED light and installed another junction box that mounted USB + lighter port. I added another LED strip that runs along the port side of the cabin ceiling and wraps around until it meets the bulkhead in front of the galley. I got the LED strip idea from Chris G's son Nick. The LED strips provide a variety of color and intensity level options controlled by remote. I'll probably use the LED strips more than the normal lights going forward.

For the breaker panel over the galley, I made a fold down door for easy access, long with a charging station and voltage meter just aft of the breaker panel. To make things less busy around the breaker panel, I added separate bus bars and a terminal block for the switched positive wires.

I'm new to electrical work so I learned a lot in the process. Here are a bunch of photos to illustrate:



Before installation

In place, looking down before battery is mounted



With everything installed

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Homemade battery box, nicknamed the Houdini box by my friends. The top piece of wood is on hinges and has clasps to keep it secure.



Looking down with battery installed before it is covered by removable shelf.



Shelf in place. Light and thermometer on right.

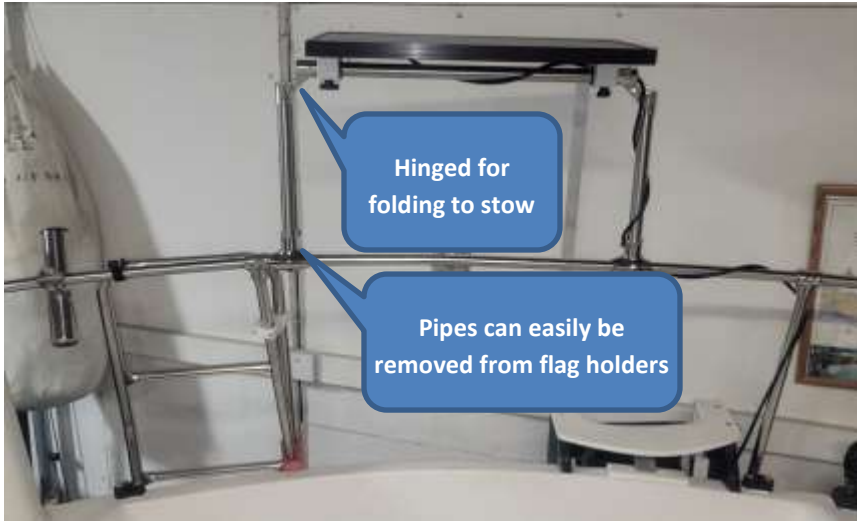
Looking aft, junction box with charger towards port, LED strip. New LED light (not turned on) towards companionway



Charger in front with extra fuse container in the middle and small inverter (that can plug into lighter outlet) below that



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Junction box that leads to the fan and the new light.

Clip to keep bar from swinging when not in use



Battery monitor and charging outlets (switches are for the chargers) under fold down bench. Looking forward at bulkhead at aft of v-berth

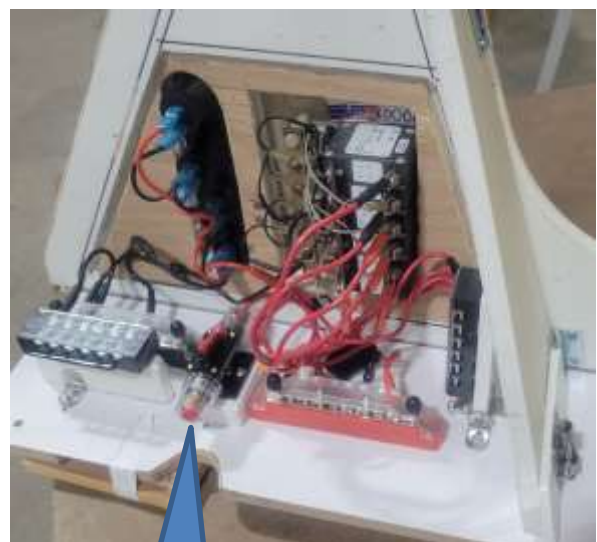
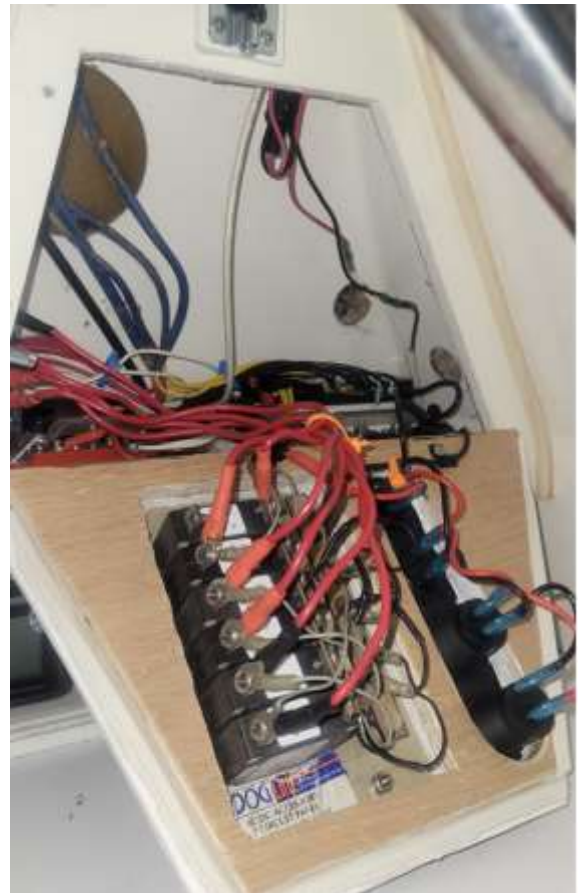
Screenshots from Renogy App for monitoring battery via Bluetooth



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Bluetooth receiver that transmits to FM radio on the boat (which is in the bottom left of photo)



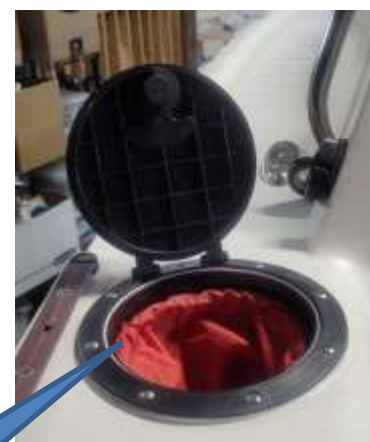
Inline breaker

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STORAGE

COCKPIT COAMING COMPARTMENTS

There was quite a bit of space going unused under the coamings towards the front of the cockpit since this area is hard to access. I added access on both sides by installing hatches made for kayaks. They claim to be waterproof and lock tightly closed. There's a removable bag insert that can hang from the ledge (red in the photo below). I installed shelves made out of HDPE, so there's no loss of under bench storage. The shelves are supported by angle brackets attached via adhesive. These have a 6" opening. I used a large hole saw to cut the hole. Per my usual process, I ground out the edges, applied thickened epoxy, faired it with Bondo fiberglass resin jelly, sealed over that with fiberglass resin, then painted over that. All screw holes were first overdrilled, filled with Thixo epoxy, then drilled and screwed into. I used PL Marine adhesive in addition to fasteners for final installation of the hatches. I might use some waterproof storage bags for gear in this area.



Showing bag insert that hangs from ledge



Underneath and outside the starboard cockpit bench, looking forward and up.

Inside view on port, looking aft. I had to install the back panel on a hinge, then flip it up and add braces



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UNDER SETTEE STORAGE – FORMER BATTERY COMPARTMENT

Since I'm down to a single battery, and that is in the storage area towards the aft of the v-berth, there was space available for use. I chose to make use of the space aft of the battery compartment as well which had previously been inaccessible (as you may have noticed, I'm obsessed with optimizing space utilization). I removed the battery box, and modified the supports to allow for a new storage compartment. To avoid having to take off all the wood on top (last season I had made a number of reinforcements), I made a compartment that folded flat so I could slide it in through the existing access, and then pop up into place. The storage area is about 30" long, 7" wide and 7.5" high. I notched the fiberglass to allow for vertical access as it goes aft. I've got several storage bins that I can drop in and slide back. For scale in the photos below, the one that's furthest forward is a 6" cube.



Before installation

Installed, looking aft

Note the hinged support on the right side of this photo. This keeps the cover open. There's also a hook that can be used with a line for additional support. The support folds and latches into place using a barrel bolt for stowage.



Three storage bins fit into this space



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WATER SYSTEM

I liked Peter's implementation of smaller water containers and a foot pump so I implemented something similar. Under the starboard aft portion of the v-berth, I made a compartment to hold five containers that each have a capacity of 5 liters (~1.3 gallons). The containers get a bit wider when filled so I put one less than originally planned and used a piece of 1" wood as filler to keep the containers snug. I made the storage for the containers as a unit first and then inserted that into place and secured it to the floor and bulkhead. After installing the storage piece, I also added a 3/4" aluminum bar that fits against the aft side of the handles and latches into place so the containers won't move around at all.

Under the sink, I added a whale foot pump with a hose that goes into one of the containers. I drilled a hole through the top of the container for a tight fit. There's a storage area for two of these containers under the sink.



Foot pump



Under galley

Before installation



Installed on starboard side under aft portion of v-berth

Hose goes to foot pump, then there's another hose that goes to the sink



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ANCHORING

STERN ANCHOR

I thought it would be helpful to have a stern anchor to deploy in a hurry if needed, or if I needed to anchor both bow and stern. I wanted it to be mounted aft to keep it out of the way, but there's already a lot going on there so it needed to be compact. I ended up using a 4" PVC pipe to store a folding grapnel anchor. The base of the PVC pipe has a cap that's through bolted. I used a second piece of PVC and an aluminum plate in between to provide support since it extends a bit outside off the edge. On the outside bottom I drilled a hole for drainage. The top cap has a handle with a small chain that attaches to the stern pulpit, and clips to keep it in place. There's a shackle on the top of the anchor to make it easy to pull out. The rode can be attached to the U bolt on the port side of the stern. I know the grapnel anchor won't add a tremendous amount of holding power, but it should set fast. We'll see how it works out. If nothing else, it was a fun project.



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BOW ANCHOR RODE STORAGE

Last year, I added access to my rode on the port side of the the lazarette and then ran it forward. This works well and I still may use this on occasion. However, I didn't like to leave my rode deployed running forward on deck normally and it's a bit of work to feed the rode back through. I thought it would be convenient to try using the rode tray at the bow as designed. I had installed a solar fan in that place, but I decided to remove that and consider where I might install that elsewhere later. The sides of this hole were not fully sealed, so like I do with any big hole in the deck, I ground out the edges, applied thickened epoxy, faired it with Bondo fiberglass resin jelly, sealed over that with fiberglass resin, then painted over that. I installed a new cap. On the top of the cap, I added a stainless steel piece that I can use to pull it out with a finger. I secured the cap with a string so it can't fall off the boat. Underneath, I added a 1/4" thick piece of PVC, and attached another stainless steel piece that I can secure the rode to with a climbing carabiner that screws shut. The rode is easily accessible and I can simply unhook the carabiner from the cap and attach it to the anchor. The working load on the carabiner is > 5000 lbs so it is plenty strong. There's also a scoop that can be installed, if I want to direct in air flow to dry out a wet rode. For rode, I've got 100' of braided line with 15' of chain. The bitter end of the rode is attached to the cleat above the tray that was already installed on the roof of the v-berth.



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MISCELLANEOUS

I installed the TillerClutch and put cam cleats on the stern to secure the line. I also added a horn cleat under the tiller aft of the clutch so I can stow the line if desired.

When working in the lazarette, I discovered some evidence that an animal (probably a raccoon) had been in there at some point and left behind a bit of scat. Since the largest opening to the lazarette is inside the coaming behind the seats, I added some PVC board as a barrier.

I also added some bars to support the bimini so I could store that aft when desired. I used quick pins so I can fold down the brace to secure against the stern pulpit, and then stow the bimini forward against the cabin when I want the coamings clear to sit on.

I found a swivel cam cleat in the discard free pile at our club and installed it to use for backstay tensioning (instead of using the horn cleat on the stern) to mimic the installation that Roger implemented on his R22.

TillerClutch



Barrier to laz, looking aft



Bimini support in use



Rotating cam cleat for backstay tensioner



Bimini support stowed

Cam cleats for TillerClutch line

