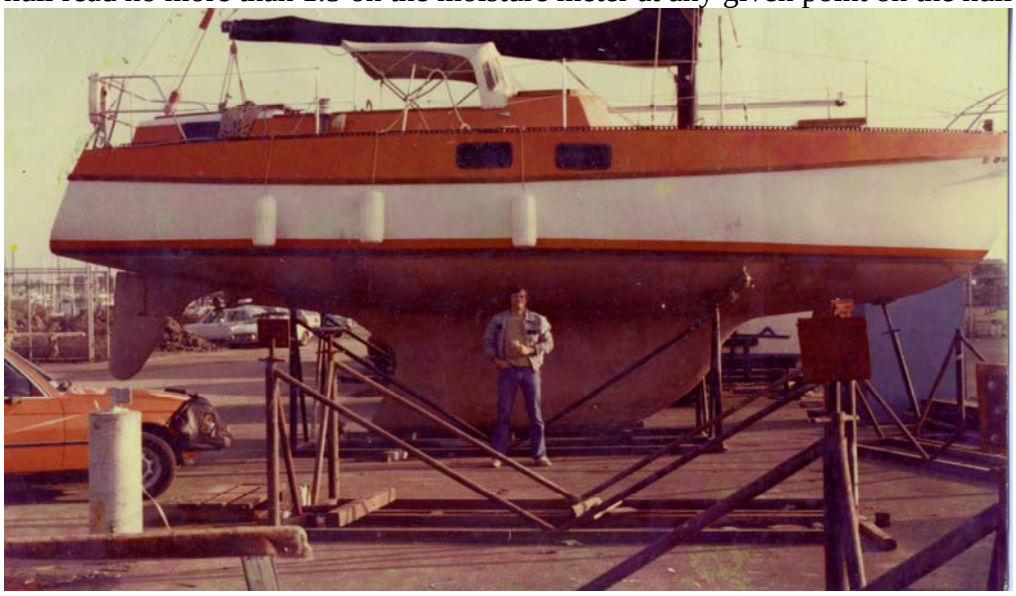
Nohona Mau 2011 Rebuild Summary

Nohona Mau was a 35 foot Yorktown CC (center cockpit) sloop hull and deck kit built in 1977.

Hull and Deck: The entire hull and deck were stripped of all hardware and fittings, and over 75% of all gel coat was removed (the hull was Gel-Planned and the decks were ground off) to expose the raw fiberglass beneath. The bare shell was left to dry for 3 years, and small holes were drilled into the keel skin to allow water to drain or wick out of voids and pockets between the keel skin and the ballast (fero-cement made up of lead ingot). The intent was to use the original hull as a "plug" to build a new fiber glass and West System epoxy resin skin encapsulating the entire hull. Everything below the waterline was reinforced with up to75 oz of Nitex 24/8 (i.e. 24 oz 45% bi-axial cloth roving stitched to 8 oz. of chopped glass mat) and 17/8 biaxial cloth. No glassing was performed until the hull read no more than 1.5 on the moisture meter at any given point on the hull and keel.



Before

After

First Dip –a New Waterline

Ready for it's first sail

The Project

All deck features such as water way and risers for stanchion bases, chain plates and deck hardware were cast in place using West System epoxy and fillers. Once features were cast and fared, the entire deck and topsides (from rub-rail up) were encapsulated in two layers of 8 oz cloth and epoxy resin, then fared using West System 407 filler and epoxy resin. Non-Skid areas were applied using a textured mold to cast sheet panels out of three layers of mat and colored gel coat finish. These panels were then cut to shape and then bonded to the deck using West System epoxy resin. The deck was then finished with a high build epoxy primer and Awl Grip linear polyurethane coatings.

Forming and Shaping Deck Features

In addition, the under-deck core at the bow was completely replaced with two layers of ½" marine ply sandwiched and encapsulated by 24/8 Nitex and roving glass cured with West System epoxy. All thru deck fittings were drilled and sleeved with PVC piping to ensure there will be no water penetration into the deck and core. The area supporting a new Maxwell 1200 vertical windlass was heavily fortified including the addition of stainless steel backing plate. The windlass can be activated on both directions from three (3) locations; the helm position, the foredeck, and from the chain locker (V-berth controls) in the event you are single handling and need to pull up the all-rode chain while packing at the same time. Another great feature is the integral pressure wash-off fitting that shoots a wash-down pump directly at the chain links as they come on board the boat on their way to the chain locker, keeping all the mud and debris off the boat and making "pulling up anchor" a mostly pleasant event.

Two new polished stainless rode locker hawse pipes with deck caps were added along with a new polished stainless fresh water fill plate and the polished stainless ventilation cowl with integral under-deck dorade box (shown below).

Fresh Paint and Hardware

A 7 layer teak glue-lam cross beam was added athwart ship just before the fore hatch to add additional stiffness to the fore deck. This along with the three layers of glass bonded to the deck with the non-skid panel application created an extremely solid and strong deck throughout..

Non-Skip Panel Bonding Installation

Final Installation – Fore Deck Area

Finally, the gunnels were fitted with new aluminum “T” track to replace the original Nicro rail. The Crest Aluminum product was attached with through bolts that matched the original hole pattern so that the old Nicro rail was cut up and used for backing plates. In addition, all new Yacht Systems stanchion bases and stanchion posts replace the old and are through bolted with backing places. Each stanchion base sits on a deck riser feature cast into the deck to keep the bases out of standing water (to eliminate water from penetration into the deck’s core).



New Aluminum T-Track installation with re-cycled rail as backing plates.

Hull: The hull was treated similarly (ground to raw fiberglass), with an aft modification that extended the stern roughly 44 inches to create better laminar flow as well as an after deck with storage for propane tanks and a storage lazzarette. The extension process was done using a cast in place mold attached to the hull to project the natural lines aft. A new transom was laminated to the crown of the old transom so it could be glassed into the new extension part, then screwed and bonded into place. Finally carriage bolts were driven through to provide final mechanical attachments and secure the hydraulic ram for the steering system on the interior side of the vessel.

Before

Hull Extension Mold for Cast-In-Place extension modification

New extension and integral bulkhead attached to original transom

New Custom Transom

The transom was designed to house a swim platform and boarding ladder, and attached to the hull extension.

Transom cowel designed for an integral swim step and boarding ladder

The deck cap was designed as a single component cast from a mold, with all features cast in place including deck hatch openings, drainage gutters, scuppers, and waterways. It was designed to carry the boats original signature line aft to meld into the new extension.

Mold: Final Part w/ Propane Locker hatch and lazzarrette hatch

Molded deck cap fitted in place

Final product fared and primed

After Hull Extension

The underside of the hull was strengthened with 3 layers of 24 oz Nitex fiberglass cloth (24 oz bi-axial cloth stitched to 8 oz mat cloth) and cast in West system epoxy. This was applied after the keel was reshaped and fared, and added strength to the keel right up through the turn of the bilge where the keel transitions into the hull.

Re-shaping and fiber glassing keel

Faring the keel for final shape.

Final Epoxy High-Build Primer and Barrier Coat.

From this point up, the entire hull was encapsulated in four layers of glass (two Nitex 12/08 with two bonding laminates of ¾ oz mat. The entire hull was then fared and sealed in high build epoxy primer. To accomplish the final layup, the boat was rolled using a special frame that allowed the layup process to stand vertically for better resin saturation and adhesion, and easier to work since the process would not try to defy gravity.

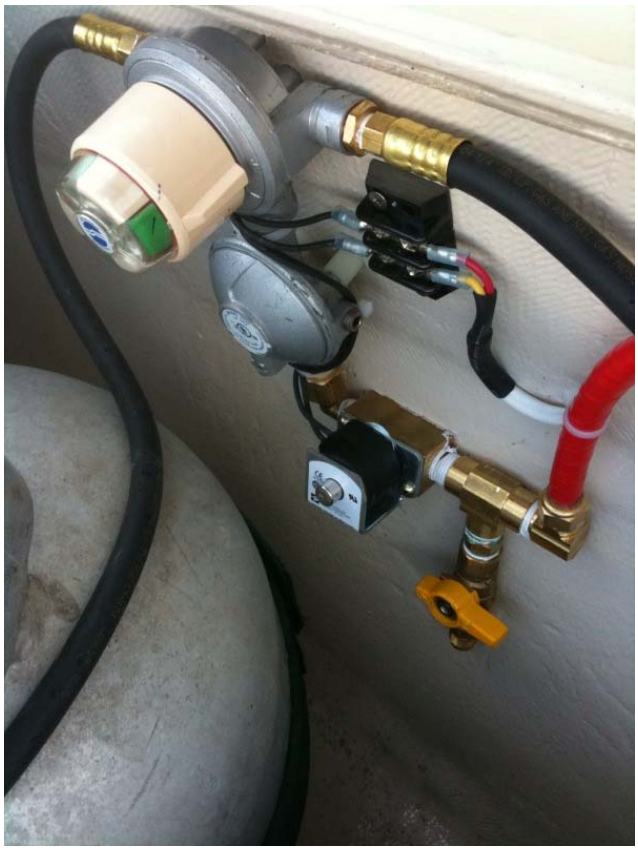
The original area that receives the propeller shaft strut was reshaped with a more streamlined version than what the original hull accommodated, and a more efficient fin-type strut was adapted.

Other hull features were fabricated to allow for the installation of three (3) high intensity white underwater LED lights, one at the bow and two along port and starboard sides at the propeller strut, to illuminate and aid in the event of a night time propeller fouling. Another thru hull feature was formed to position a combination speed log / depth transducer just forward of the leading edge of the keel (at the bow).

Ventilation: Two dorade boxes were built into the deck boxes to provide venting into the salon, and a third in the forward chain locker to provide ventilation into the v-berth. 4 inch 316 SS polished cowls were fitted with screw-on deck plates to provide a water tight seal when the cowl is removed and stored. 12 volt electric vent fans were added and wired to the solar panels to assist interior ventilation and air flow during daylight hours.

Port Lights and hatches were refurbished with new gaskets and Plexiglas lenses. The aluminum hatch frames were sand blasted clean of any prior coatings, then powder coated to provide a porcelain-like finish that is impervious to the elements.

The new under deck propane locker was vented at three locations for ample dissipation of stray gases.

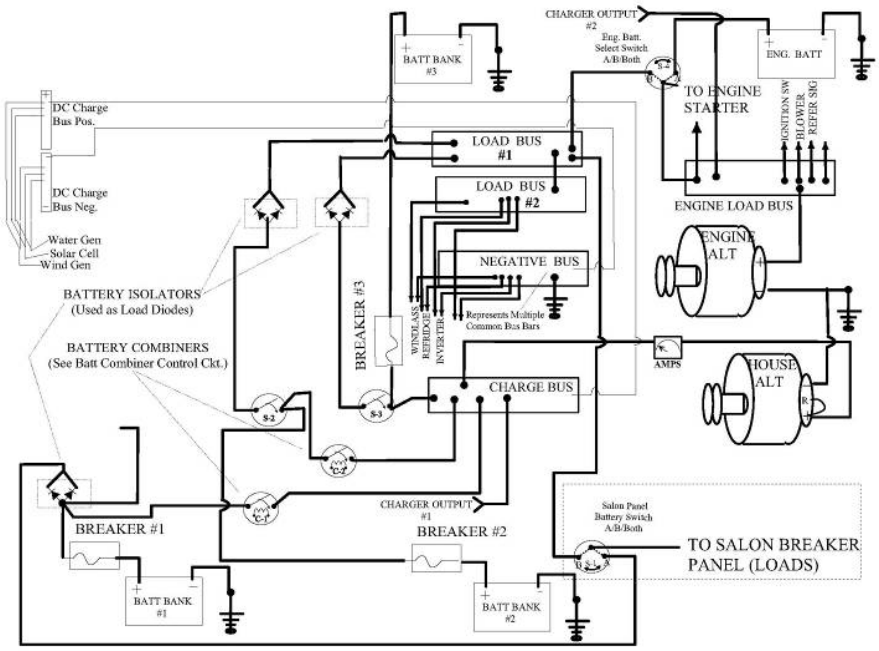


Although the vessel has a diesel auxiliary, an electric blower was added to the engine compartment to aid engine ventilation and cooling.

Electrical System: Entirely new electrical wiring was installed throughout and powered by a three-bank house and utility battery array charged by a 130A Motorola Load Handler alternator and a

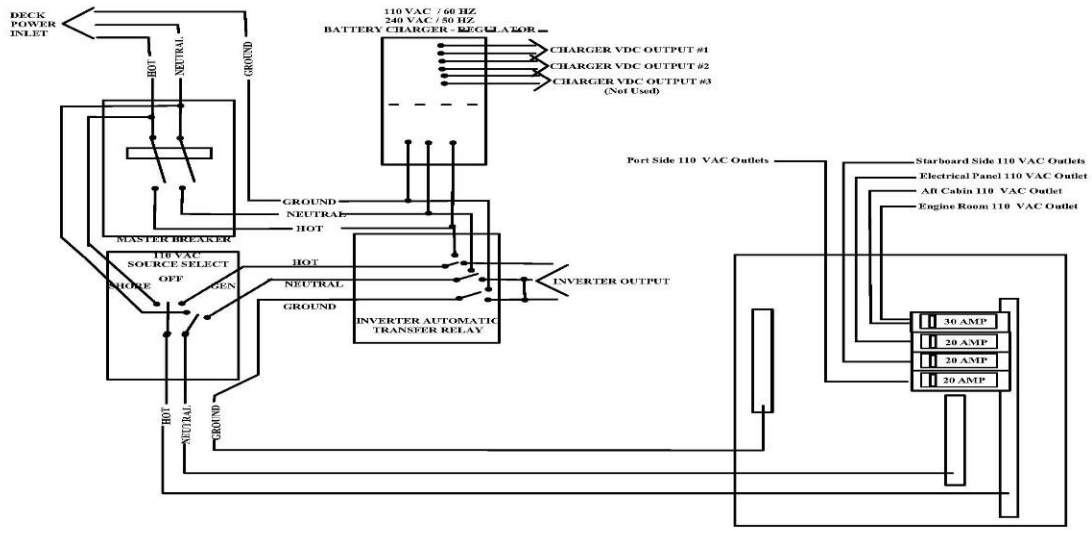
separate engine starting battery charged by a Balmar 65 amp back-up alternator. All battery banks are charged with a shore-powered three stage / 3 bank battery charger with optional battery temperature sensors and remote monitoring panel. There is an electrical breaker panel in the V-Berth supporting all water pumps, a forward bilge pump that also doubles as the shower sump, and the waste macerator pump and (future) water maker. All primary distribution cabling for the forward electrical panel, N2K signal cables, Windlass (and related control wiring), and SONAR transducer are run through 1 ½ inch corrugated Teflon inner duct conduit so wire pulls can be added in the future without ripping apart the interior. Similar duct systems are used to connect the main electrical panel to the electrical distribution system (engine room) and three battery banks. Ducts continue running aft from the engine room into the lazarette and used to route and protect antenna, navigation lights, solar panels, and N2K sign al wires

Heavy loads are isolated to draw from Bank #3, and include the Maxwell Windlass, Glacier Bay holding plate system, and 1800 watt DC/AC ProSign inverter with remote monitoring and activation controls (located in the galley).



The AC system was supplemented with a shore power / generator cut-off switch to allow selection of AC power from shore, or via the inverter with shore-power sensing relay (the normally on position).

All loads are fed through a central breaker panel located in the engine room supporting 20A circuits for all cabin outlets.



AC Electrical Schematic for Shore Power and DC / AC ProSign 1800i Inverter

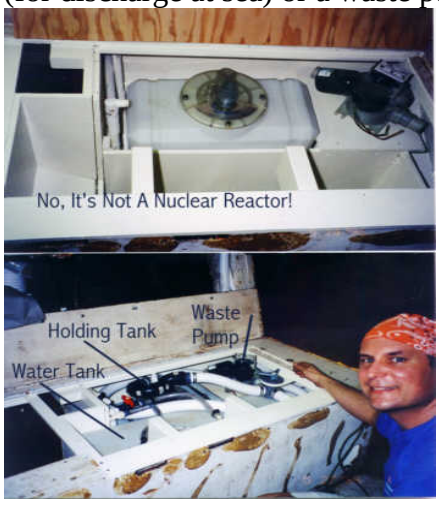
In addition to the refrigeration, inverter, and charging systems, two (2) 130 watt Kyrocera marine grade solar panels were added to the new stern rail system, and each of the three battery banks has it's own charging regulator (Flexcharge[tm] Ultra Efficient 25 Amp Charge and Load Controller model NC25A/12).

Plumbing

New plumbing was installed throughout the boat, and designed to include a salt water main allowing the taping of filtered salt water from anywhere within the bilge (to accommodate engine intake, water maker, galley foot pump, head intake, and wash down pumps). Similarly, a fresh water bus line also exists, and is plumbed with a cross over valve allowing fresh water to pass into the salt water line for maintenance and emergency engine cooling situations. The engine boat can draw from the fresh water tanks and flush it's raw water components as a maintenance feature when the boat is put into storage or engine maintenance is done in the boatyard when it is high and dry.. In addition, the wash down pump is able to be plumbed to the hot water side of the boats fresh water system, which allows for hot salt water showers as well as pressurized salt water input to the engine's raw water heat exchanger, in of an emergency when the raw water pump impeller fails right when you need it. Simply turning two valves allows the operator to force pressurized salt water through the engines heat exchanger to cool the beast in the bilge. Manual foot pumps were added in the galley for both the salt and fresh water sides of the system and plumbed with back flow valves to allow the salt and fresh water to feed through a common spigot.

The boat is equipped with a Paloma instant on hot water heater which runs off propane. The propane system is plumbed with copper tubing wrapped in red tape for identification purposes, and includes an electric activation solenoid located in the new propane locker. Two aluminum 20lbs propane bottles are connected to the system via a tank selector valve. The tanks were tested for DOT inspection in 2010. A take-off with a shut off valve is also located in the propane locker allowing for a quick connect gas hose extension to the stern pulpit mounted Force 10 BBQ grill.

A holding tank system for the head waste meets the minimum 6 gallon requirement (no sense carrying more crap than you have to), and is plumbed with a "Y" that allows diversion to a macerator pump (for discharge at sea) or a waste pump out deck plate for extraction at a pump out facility.



Fresh water storage includes: V-Berth tank, 40 gal.
Port Side Saddle Tank, 20 gal. (and plumbed for a water maker)
Starboard Side Saddle Tank, 20 gal
Lazarette tank, 38 gal.

Construction, 38 gal. tank fitted under decking in the lazerette

All tanks are plastic construction, fitted with inspection ports, and each have their separate open/closed valve controls but feed into a common fresh water bus line, which allows all tanks to be filled from either the bow or stern deck fills when all valves are opened. Once filled, each tank can be tapped off and used when needed. Typically, we use the V-Berth tank first, to lighten the load at the bow end of the boat. We use the lazerette tank last as the boat carried her weight best in the aft section. The port and starboard saddle tanks are usually opened simultaneously to act as a single 40 gallon reservoir.

A single Sureflow fresh water pressure pump is located on slide tracks within a V-Berth locker (along with the salt water wash down pump), making them easily accessible for service and repair. A Groco pressure tank is also fitted in the same area to regulate fresh water pressure throughout the boat. A separate (smaller) pressure regulator tank accommodates the pressure salt water system. Along with the main galley, hot/cold pressure water is available in the head, shower, and the aft cabin sink.

Aft Cabin

V-Berth (looking into head)

V-Berth with anchor rode locker doors

Engine and Fuel Systems

The diesel fuel system incorporates a 50 gallon Tempo ABYC approved plastic tank with integral (electronic) fuel sensor. The fuel pick up line is run through a quick connect fuel fitting (as used on outboard motors) to allow the operator to switch to a secondary fuel source in the event of fuel contamination in the main tank. The return line passes through a "Y" valve that directs the return to either the main tank or the emergency day tank In addition, the system incorporates a dual filter using Racor FG500 filters and a selector valve. An inline electronic fuel pump allows the system to polish it's own fuel. By activating the pump while sailing, the system continually scrubs the fuel from the main tank passing it through the secondary filters and back to the tank via the return line. After a long sail, the operator can switch the selector valve to pull form the other filter and then clean the inactive Racor unit that was spent doing the polishing work. In addition, the electronic pump can be used to bypass the engines integral mechanical pump in the event of a failure to the pump's internal diaphragm. In such an emergency, the operator switches two valves in the system to bypass the engine's mechanical pump and run on electronic pump back-up. It is also helpful to have when maintaining the engine and bleeding the system. A remote start button is located in the engine room for easy access to turning over the engine during maintenance and repair procedures. The engine room

includes an automatic oil changer which is plumbed directly into the engines crank case to facilitate easy oil changes.

Engine

Auxiliary propulsion is via a recently rebuilt Perkins 4-107 diesel. Roughly 40 HP, the engine is fitted with a double pulley drive belt system providing a power take-off to the 130A Motorola Load Handler high output alternator. Although the engine is a product of the 1970's, it has been well cared for and is virtually indestructible given the fact that it incorporates cylinder sleeves set into the block. The rebuild included new cylinder sleeves with mated pistons and rings. To improve maintenance and serviceability, the oil filter, primary fuel filter, and heat exchanger were relocated off the engine to more serviceable locations, along with the addition of an oil changer pump an easy task of changing oil and filters. The engine room has removable partitions than can contain and seal off the engine area itself (bed log to bed log) from the other systems (electrical distribution, refrigeration, and solar and shore power chargers) so that they are not exposed to excessive heat and oil/fuel vapors, which keeps the general area clean and workable.

A Borge Warner velvet drive transmission with a 1:1 reduction gear turns a Maxprop 3-blade folding propeller on a 1" Auquamet 22 stainless steel shaft. A standard shaft log from Sparten Marine is fitted along with a pilot bearing to guide the shaft roughly 2 feet from the vibration dampening / isolation coupling. The engine is completely isolate (electrically) from the running gear.

Ground Tackle

The bow plate incorporates two (2) rollers, one rode and one for 5/16 chain, and includes a chain stopper welded to the bow plate. 300 feet of 5/16 chain is stored below the v-berth, with access to the chain locker from the foot of the V-Berth below the forward cushion. Another 200 feet of line is stored in the forecastle road locker, accessed via the butterfly doors at the foot of the V-Berth. A 35lbs CQR is attached to an all chain rode, and 22 lbs Bruce and 35 lbs Danforth are stored for use on 3/8" chain and line rode. A parachute style sea anchor is also on hand, but has never been deployed.

Stern Rail

Then new stern rail was designed to provide fastening for the two solar panels which fold down and secure (pin in place) to the port and starboard sides when not in use.

130 Watt Solar Panels - Port & Starboard

Folding Hinge using 7/8” SS Tubing and Elbows

New LED flood lights were added to the antenna arch feature as well as red LED deck illumination lights which are located under custom made bench seats secured to the port and starboard rails. An integral antenna arch was adopted to the design to accommodate the GPS and long-wire short wave (HAM radio) antenna systems.

In addition, removable davit booms secure into receiving sockets on the upper (antenna arch) and lower (Biminis cover) bars and re-enforced with thick wall 1” SS tubing. Each davit boom was designed to support the full weight of a 230 lbs man in the event it needs to be used for life safety and recovery events.

Galley and Salon

The galley was fitted with two stainless steel sinks, both designed to be located along the centerline of the boat (where they should be) with one being a larger deeper utility sink for seagoing use and fitted with a top to match the counter top surface so when not in use the area can be used for added counter space. A cutting board was placed on the underside of the counter top plug.

A Force 10 three burner propane stove with oven and broiler replaced the old Magic Chef galley stove, and a stainless steel microwave oven was added as well. The stairs into the cabin double as sliding drawers for storage of supplies, flatware, and cooking utensils, as is another drawer directly under the stove which houses nesting cookware (pots and pans). A seagoing crash bar (stainless steel) was fitted to provide a safety feature when cooking in a seaway. The garbage can tilts out from the back-side of the galley island, whereas the galley design allows for two crew members to work together.

Salon incorporates under cushion storage lockers designed to include adjustable baffle boards. This way, as supplies that tend to roll around (i.e. canned goods) are consumed, the compartment can be reconfigured to compress the remaining storage area needed to contain and secure the supplies from rolling freely in a seaway. All cabinets and drawers have mechanical locking mechanisms to secure them in a seaway.

The entertainment system and primary electrical breaker panel are located on the starboard side of the salon. A new Sony XAV 62BT Entertainment system was added for audio (CD /MP3 USB) and video (DVD) with a color touch screen controls.

Electronics

The boat was fitted with entirely new electronic instrumentation, including Garmin 18 HD radome, a Garmin 5212 Chart Plotter (12.1 inch) w/ touch screen for a cockpit display, a secondary 5208 Chart Plotter w/ 8 inch touch screen display for the navigation station. Networked transducers include a Garmin GWS-10 mast head mounted wind direction and speed transducer and an AirMar 3 in 1 transducer (boat speed / depth / H2O temperature) connected to a Garmin GSD-22 SONAR module, and a Garmin GPS17X antenna mounted on the stern rail antenna arch. A Garmin GMS10 network port expander is used to connect GarminNet devices, and a NMEA 2000 network backbone runs throughout the boat to support the NMEA200 compatible instrumentation as well as connections to the new Simrad AP28 autopilot using an AC42 pilot computer. A Simrad NMEA2000 attached RF25 rudder feedback unit and Rate Compass are used for the auto pilot, but data from any NMEA2000 connected device can also be displayed on the Garmin chart plotter or the two GMI10 multi-functional color instrument displays in the cockpit. The Simrad pilot computer is equipped with Simnet (NMEA2000) interface, allowing it to steer by GPS or transducer inputs including Apparent Wind or Depth contour lines. The "Fuzzy logic" system senses and learns boat steering characteristics on varying points of sail and self adjusts (learns), driving a high volume hydraulic motor drive unit coupled to the boats hydraulic steering ram at the rudder quadrant. A Simrad WR20 wireless transceiver and handheld allows wireless handheld control over the autopilot as well as display of data originating from any instrument on the NMEA200 network bus. Radio transceiver gear includes a new ICOM 802 SSB/ HAM transceiver with automatic antenna tuner, and Standard Horizon VHF radio with masthead mounted "squatty body" VHF/AIS antenna. For off-shore safety a new ARC Globalfix Pro EPIRB with hydrostatic release was added, which includes an optical interface for acquiring current GPS coordinates from the Chart Plotter over a NMEA2000 network connection.

Refrigeration

The Glacier Bay system includes a single sub-zero eutectic solution holding plate pulled down by a direct drive compressor unit powered by a low speed/high torque 12 volt DC motor. A dual set-point thermostat is used to sense 50% depletion and kick in only if the engine running. The second set-point is set to 90% depletion and runs the system off battery or off shore power and solar if connected. In this way, the system operates like an engine driven system in that it takes advantage of "topping off" the system any time it sees the engine running, with the advantage that it will still run on batteries for days when you are not around to start the engine or charge the batteries via an alternate source.

The ice box was designed and built using Dow Corning vacuum encapsulated panels which are only 1 ½ inches thick but provide a thermal insulation rating equal to 8 inches of traditional foam. In this case, the size of the box area shrinks dramatically by eliminating the space taken up by foam type insulation, and the vacuum panels never degrade or become saturated with moisture as foam may do over time thus rendering them useless.

Rigging

All standing and running rigging is replaced, including tangs and attachment hardware (chain plates, U-Bolts, and backing plates). Chain plates for lower and upper shrouds were custom fabricated of stainless steel and designed to through bolt to the interior bullheads and reinforcement knees.

Mast

An internal halyard for a staysail was added at 330 feet up the mast (41 foot mast height off the deck) allowing for a ¾ (fractional) rig arrangement. In addition, all new mast and navigational lights were installed, using Lopo[tm] Lights (LED) for the TriColor / Anchor, as well as the bow and stern lights. A Forespar[tm] combination foredeck / steaming light was added and prefabricated to use only LED lamps in place of the standard Halogen and festoon incandescent lamp that ships standard with the product. A high intensity strobe light was added at the masthead. All mast wiring was new, including a masthead VHF antenna using low loss RG213 coax cable. A new self-leveling radar antenna mount was added just above the spreaders to accommodate an 18" diameter Garmin HD radar antenna dome. Two spreader lights were added on port and starboard sides at spreader height using Dr. LED model "Kevin" high intensity LED arrays, and activate along with the Forespar foredeck light..

A new Garmin wind direction and speed transducer was placed at the masthead using a NMEA 2000 network connection internal to the mast. All power and signal cables exit the mast by way of stainless steel halyard exit plates for a clean exit that does not kink or abrade the wire insulation. A custom designed mast step deck plate was built to include a 1" stainless tube bent to 170 degrees to be used for wire pass-thru to the interior wire-way. The tube passes completely through the deck's marine plywood core so there is no chance of water infiltration and rot as the wire-way passes through the deck.

A new Harken System "AA" mast track was installed using #8 machine screws on 2 inch centers, to accommodate a new full batten mainsail with captured bearing cars at the battens and sliders for the intermediates. A new lazy jack system, was added with a single-pull internal halyard system.

In addition to the masthead VHF antenna, mast was fitted with an separate insulated wire that runs back to a small mast on the antenna arch for a custom fitted long wire antenna system for the ICOM 745 Ham Radio set.

A new 12 foot section of 1" "T" track was added to the bow facing edge of the mast, along with spinnaker pole slide cars to accommodate vertical storage of whisker pole(s).

The mast was fitted with Mast Walker folding mast steps to facilitate going aloft in safety. These particular folding mast steps are preferred as they fold into the mast and secure against the mast itself, lowering windage and never fouling stray halyards and lines.

Two refurbished Barrient 22 two speed winches were added to the mast that included Barton Marine "Wincher" self-tailing rubber adapters.

Sails

A new full batten and loose footed mainsail was fitted with captured bearing batcars at each batten (4 total). Five intermediate sliding cars fall in between the battcars. A second triple stitched mainsail is equipped with slides for standard slide track, and can be hoisted in the event the mail sail is damaged using the secondary slide track installed along side the Harken System "AA" roller bearing track. This auxiliary track is also to be used for the storm trysail. Head sails include a new roller furling 130% Genoa, and an older but lightly used 115% jib as well as a storm jib. An older genoa was modified for a grooved hoist for use on the Furlex roller furling headstay.