

The Classic Yacht Symposium 2008



A Return to the Edwardian Era- Completing CANGARDA Initiating CORONET

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Photos courtesy of the authors.

ABSTRACT

This is a two-part paper concerning the work on two significant Edwardian era yachts by an experienced restoration team. The paper completes the description of the restoration of the steam yacht CANGARDA, first reported in CYS 2006, and outlines the scope of work planned for the "last grand American yacht" CORONET.

INTRODUCTION

The restoration of CANGARDA was first discussed at this Symposium in 2006. The presentation centered on the description of the vessel, her history and the goals of the restoration to make it as faithful to the original vessel as possible. Progress at that point included the completion of the rebuild of the steel hull up to its first coats of epoxy primer. We also discussed the planning for the conversion from coal to oil burning for the boiler, some deck structure building requirements, the change from a welded as opposed to riveted hull, and electronic controls for burner/boiler management.

Herein we discuss the completion of the restoration of this historic vessel and plans for the future of this, the last American constructed Victorian steam powered yacht.

CANGARDA, the 1901 steam powered yacht, was launched on the 24th of August 2007 in Pt. Richmond, California, the culmination of three years of work by Jeff Rutherford and his team.

This paper discusses the efforts involved in restoring the vessel to original lines with the original wood work, metal parts and engines available. The extensive "fabric" available was an inherent part of the attraction of undertaking this project. We will discuss the challenges this project faced in the preservation of this original fabric and its incorporation into the final product.

Because the steam engine and systems of a vessel in excess of 65 feet created a complexity not often encountered today, the project was challenged by issues related to the regulatory mandates of governmental agencies.

CANGARDA is to be a vessel that is used and moved about. She is intended to be a fully seaworthy vessel capable of oceanic voyages and built to ABS standards. The conversion to oil from coal allowed automation of the operations but required finesse to keep them from being intrusive. Further, we discuss the effort taken to hide other day to day systems incorporated into this restoration that make it possible to operate CANGARDA with a modern minimal crew and on time scales that are more suited to the twenty first century life style.

COMPLETING CANGARDA

Three years ago, the restoration of the 1901 steam powered yacht, CANGARDA, was initiated at Rutherford's Boat Shop in Richmond, California. The goal of this project was to restore the vessel to its original form and graceful status using all the original materials that had been preserved and were available

thanks to the efforts of Richard Reedy and Elizabeth Meyer. (Please refer to the Appendix for the outboard and inboard profiles and deck arrangements.)

The list of materials was extensive because Richard Reedy, a former owner, had dismantled the vessel in an attempt to restore it in the 1980's. All the original components were put into storage, including the partitions, paneling, furniture, stairway, hardware, both deck houses, seven steam engines, other engine room plumbing and electrical fittings, deck fittings and rigging hardware. All were kept in usable condition for 20 years.

The major changes in CANGARDA are the installation of an oil fired boiler as opposed to coal fired, the use of plywood in the understructure of the deck, the installation of electronic controls for the burner/boiler, the structural changes in the hull, and modernization of some domestic systems.

Other systems have also been added but in a fashion that keeps these "modern elements" to a minimum and out of view to the casual observer. For example modern requirements insist on storage of both black and grey water, or the installation of an oily water separator to comply with waste disposal by the USCG. Also, generators and like equipment were placed in the old coal bins out of view. However, we still have the coal hatches in the deck in the same location as on the original vessel.

Hull

The hull has been rebuilt with 1/4 inch steel plate welded construction to ABS standards. This fabrication

was required to get classification by ABS and USCG approvals. Riveted construction is not well thought of by these parties because of rust problems between the frames and the skin. Further there is a "one foot rule" by ABS (and other vessel classification authorities, such as Lloyd Register and Bureau Veritas) which in general states, for example, that a perforation in the hull can be repaired only by cutting out the steel one foot around the hole and welding a like plate in that place. In short, an impossibility when dealing with a riveted, rusted and battered one hundred year old hull.

We were able to save some of the original hull including bulkheads, ports, stern frame, rudder, and ladders. Sadly, we must confess much of the hull is new construction. ABS requires inspection of all seams, including examination by dye and x-ray to ensure no imperfections or cracks in the welds. The bulkheads and ports (preserved from the original) were all tested in the presence of an ABS inspector, with high-pressure water to ensure no leaks.

Fairing of the hull was a massive process undertaken by Allen Rainey Yacht Refinishing of Maine. The process is to apply epoxy resin fairing mixture to the primed hull. This is then sanded to a fair line using battens to estimate the curve. The hull is then hand sanded with two-man fairing boards. After much filling and fairing, final coats of primer are applied, a massive job on a 126 foot hull. Allen and his team were employed for better part of a year applying fairing compound and sanding the hull. Figure 1 depicts some of this work.



Figure 1 – Hull of CANGARDA showing fairing compound applied and sanded through color layers.



Figure 2 - The hull ready for painting.



Figure 3 - Completed painting of hull.

One can note in Figure 1 the “see throughs” on the various layers of fairing compound. Figure 2 shows the vessel ready for final sanding and finish and Figure 3 is the painted hull using Zephyrus green by Awlgrip.

The deck structure, mandated by ABS was two layers of 3/4 inch ply, glass fiber reinforced between the layers

and with structural fiberglass applied prior to the final layer of teak. The teak was then glued (no fastenings) and caulked to this surface. This construction allowed us to have a wood deck as opposed to a steel one and still meet the engineering formula outlined by ABS. (Figure 4).



Figure 4 - Deck: two layers of plywood prior to teak.

As seen in Figure 1 the bulwarks are made of mahogany bolted in place in standard construction of the time. Two bronze freeing ports were added into the bulwarks on each side of the vessel as a requirement of ABS. They were faired in and painted the color of the bulwarks to make them less noticeable. The cap-rail is of new wood but again using original standard construction

The stanchions for the hand-rails are original and installed in the original fashion and height. The height of the hand-rail was not to current standards allowed by ABS and USCG. However, we successfully negotiated their approval. The hand-rails for the steering station on the upper deck of the forward house are of original wood, as is the complex curved piece that joins the forward end of the hand-rail to the cap-rail.

Deck House

The deck houses were reconstructed and restored to their original condition and grandeur. The original frames for the after house (spruce 3x3) were saved as were the original panels of Cuban mahogany. Indeed, in the restoration process, shipwright Chris Morrison of Rutherford's team was able to identify the matching panels in each series, making the deck-houses at least 80% original fabric. (Figure 5)

Skylights

Much the same care was taken in restoring the skylights. The old varnish was scraped to bare wood prior to refinishing. Extensive care had to be taken in staining these pieces as new wood that was used in repair had to be matched in color to the original mahogany. This effort became a project in itself led by Frederique Georges.

A few parts were completely missing and had to be reconstructed, for example, the engine room skylight.



Figure 5 - After cabin being reset on the deck.



Figure 6- Replication of the engine room skylight showing the grates protecting the side lights.

Only the side windows and their protecting grates were still part of the collection we received. We also received one carlin, which had enough evidence on it to tell us how the skylight was constructed as well as the location of the windows and hatch. The engine room hatch doors are original. (Figure 6)

Engine Room

Steve Cobb, Captain of CANGARDA, was in charge of the restoration of the engine room. The seven original steam engines were in storage with the vessel parts. These included: a Sullivan triple expansion main engine (250hp), a feed pump, donkey pump, circulating pump, air pump, bilge pump and windlass. All these were restored and placed in the original location. Many of the original valves were saved and reused. The original steam gauges were calibrated and installed. The condenser was restored and put in place with the original hand-hammered copper steam exhaust pipes.

A major challenge was the restoration of the "donkey pump" which had a complex bottom casting that had cracked due to water freezing in the chambers. The casting technique required was not only exacting but

required rethinking the complex procedure for making this part. Standard sand casting techniques failed many times when the molten iron “floated” parts of the mould in the casting process.



Figure 7 - Side casing of the main engine.

CANGARDA has had three different boilers in her lifetime. The first one burned coal and fit nicely under the deck. To achieve more power and speed, it was replaced in the 1930s with a more powerful coal burning boiler that did not fit under the deck and which required the building of a special metal house above the deck. We installed the third boiler for CANGARDA, which was redesigned and fabricated by Rentech again a Coast Guard “suggested” process. By converting to oil as a fuel and using steam atomization a more efficient burn has been created. The new boiler allows the same efficiency as the second boiler but it now fits again under the deck as was the case of the first boiler for CANGARDA. (Figure 8)



Figure 8 - New Rentech boiler being lowered into the engine room by Steve Cobb.

A major element of complexity in the restoration of CANGARDA has been how to minimize the “modern” systems required to operate this vessel under current regulations. For example, in developing the oil fired boiler CANGARDA is required to have greater electrical power than was required originally as a coal fired vessel. To minimize the visual exposure to modern generators, these units were placed in what are the original coal bins. While not completely hidden, the ambiance of the engine room has thus been preserved. Most of what one sees is the original engines, gauges, engine room telegraph, oil drip cups and insulated piping.

The original electrical panel made of 1 inch slate with steel framework was re-hung in its original position. While the open knife switches are not allowed to be reused, the original volt and amp meters have been rebuilt, recalibrated and will be functional.

Support vessels

Three support vessels were constructed for CANGARDA. These include a 21-foot diesel launch, a 21-foot whitehall and a 15-foot “Maine Wherry.” These were constructed in a plank-on-frame manner with oak frames and spruce or yellow cedar carvel planking.



Figure 9 - Maine Wherry under construction.

The davits from which the support boats are carried on CANGARDA are original as are the bearings.



Figure 10 - 21-foot "whitehall" support boat.

Spars

Masts were constructed of clear Sitka spruce. The staves for the masts were made from 40-foot 2x4s, scarfed, tapered, and glued into a hollow round structure using the 'bird's mouth' style of construction. The rough spars were hand planed round and sanded as they were turned on a purpose-built lathe. As each spar was in excess of 65 feet, bearings were required on the lathe bed for support in the middle as well as ends of the spars as they were turned.

In addition to the two masts, seven other spars were built. These included two gaffs, one boat boom, one flagpole, and three davit poles. The davit poles are lashed to the davits to steady the boat while hanging on the davits.



Figure 11 - 65-foot staves are glued into a hollow mast.

The standing rigging is all soft-eyes aloft with hand spliced thimbles at the bottom. All the original turnbuckles are in place. The hand splices on the standing rigging were done by Brian Toss of Port Townsend, Washington.

Domestic Systems

A non-trivial element of the restoration was developing the systems (and hiding these systems from view) for the storage of black and grey water. Because of the age and design of CANGARDA, there is little space in below the cabin sole. Plumbing systems needed to be above the shaft in the shaft alley and because of the confined space, elaborate manifolds needed to be built. Again, due to the space available, these waste tanks are of minimal size for the size of the vessel. Spring faucets were chosen to help control the amount of wastewater created.

Air conditioning is another modern feature of CANGARDA. The air conditioning system is reverse cycle, providing both cooling and heating to the boat. Although the compressors and blowers would naturally be hidden from view, ducting the air was the difficult part of the installation because of the confined spaces available. For this purpose, custom ducting was built to fit between the frames of the hull.

Bridge

Finally, the original steering station, engine room telegraph and compass binnacle are in their original position on the top of the forward deckhouse, which was where all control of the boat originally took place. We have added an automated bridge inside the forward deckhouse, which provides complete control of the vessel and engine room, decreasing the need for an engineer in the engine room. The automated control is now housed in a "built-in side board" which hides the computers and control elements for the automation of the engine room. Also hidden are the electronic controls for the steering, throttle and transmission of the main engine. Complete control of the vessel can happen in this new bridge. A cabinet top covers all these controls while at anchor, allowing the appearance of a splendid dining

room for eight. It is only while underway and the top is off the cabinet that the controls for the vessel are visible and active navigation and control of the vessel is apparent.

Final details

With the engine room worked out, the deckhouses installed, and the accommodations complete, the endless detail of the completion of the restoration continued. Original port lights and skylights were installed. Slate counters were used in the galley. Original sinks and plumbing were used in the heads. The silver service is locked in the drawers in storage boxes constructed as the originals. Dinnerware has been copied from the originals from the Fulford museum (with appropriate change of

affiliation detail). We are currently in search of certain silver pieces of the period to finish off the details of the vessels dining suite.

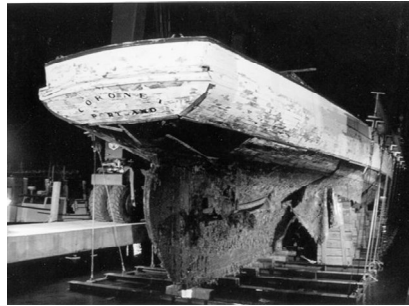
It is the intent of the owner to place CANGARDA in museums on the East Coast of the United States when not partaking in classic racing events. Discussions are underway to have as primary port the Mystic Seaport in Connecticut. CANGARDA will welcome visitors free of charge.

With rigging in place, tanks filled with oil and water, a head of steam coming up, CANGARDA is ready for her second career as an ambassador of history.



Figures 12 & 13 - CANGARDA at the dock for completion.

Initiating CORONET



INTRODUCTION – CORONET

In 2007 the Coronet Restoration Partners took possession of this “last grand American yacht”. The goal of the Partnership is to restore this great yacht over the next several years. In a very real sense this action is a continuation of the work of John Mecray, Elizabeth Meyer and others.

CORONET is to be restored to her original glory with a clear goal of retaining as much of the original fabric as possible. Project goals and criteria will be presented. . There is much of that original fabric in storage (cabin interior) and much in the current hull (particularly the bottom planking. The principals of the Coronet Restoration Partners have a history of working diligently in preserving remaining structure.

The restoration will also take into account the practical nature of maintenance and the ability of the vessel to be sailed on the open sea. An outline of the plans and materials made available will be discussed. Much of this material is well preserved due to the efforts of IYRS.

THE SCOPE OF WORK – CORONET

Last Fall, the Coronet Restoration Partners completed the study of the layout of the work area in Newport. The team is a continuation of the group that has restored JOYANT (CYS 2005), CANGARDA (CYS 2006 & 2008) and now CORONET. Proper papers have been attained for the lead members of the shipwright crew. Work has commenced.

The first goal has been to set CORONET on a well founded keel. Raising the vessel to enable the removal of the keel, inspect the timber, repair those parts that are subject to repair and then setting the vessel back down is the first call of effort. (Figure 14)

From here the deck will be removed as well as the deck beams. These will all be preserved, inspected for fastenings, planed and varnished for protection from elements. The deck beams are in good condition and it is not expected that much repair will be necessary for these pieces.

The hull frames are then to be removed sequentially. The trunnels are cut with a sawsall and the frames stabilized, lifted out with the overhead crane and placed on the frame table on which the outline of that specific frame had been lofted. Each futtock is removed, inspected for condition and replaced in the frame after cleaning to bright wood or replaced with new wood as required. After refastening, the completed frame is replaced in the hull.

When about a third of the frames have been restored it is likely that the hull will become quite loose. It may be that about this time we will begin to remove the planking, refinishing each piece and refastening these planks to the new repaired frames and jacking the vessel back to the original shape (Figure 16)

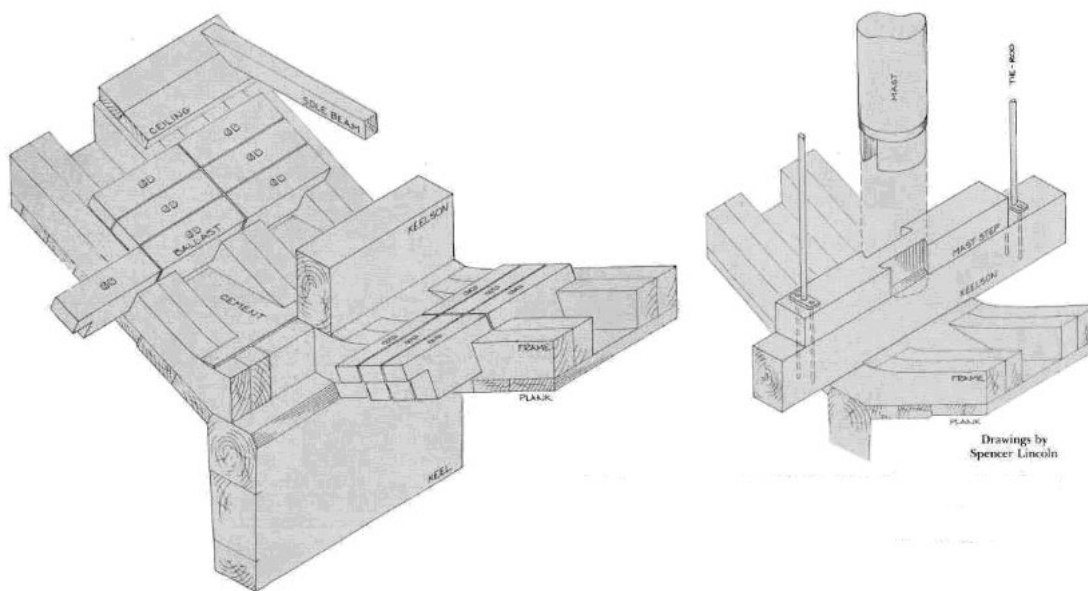


Figure – 14 CORONET Details of the frame and keel structure.

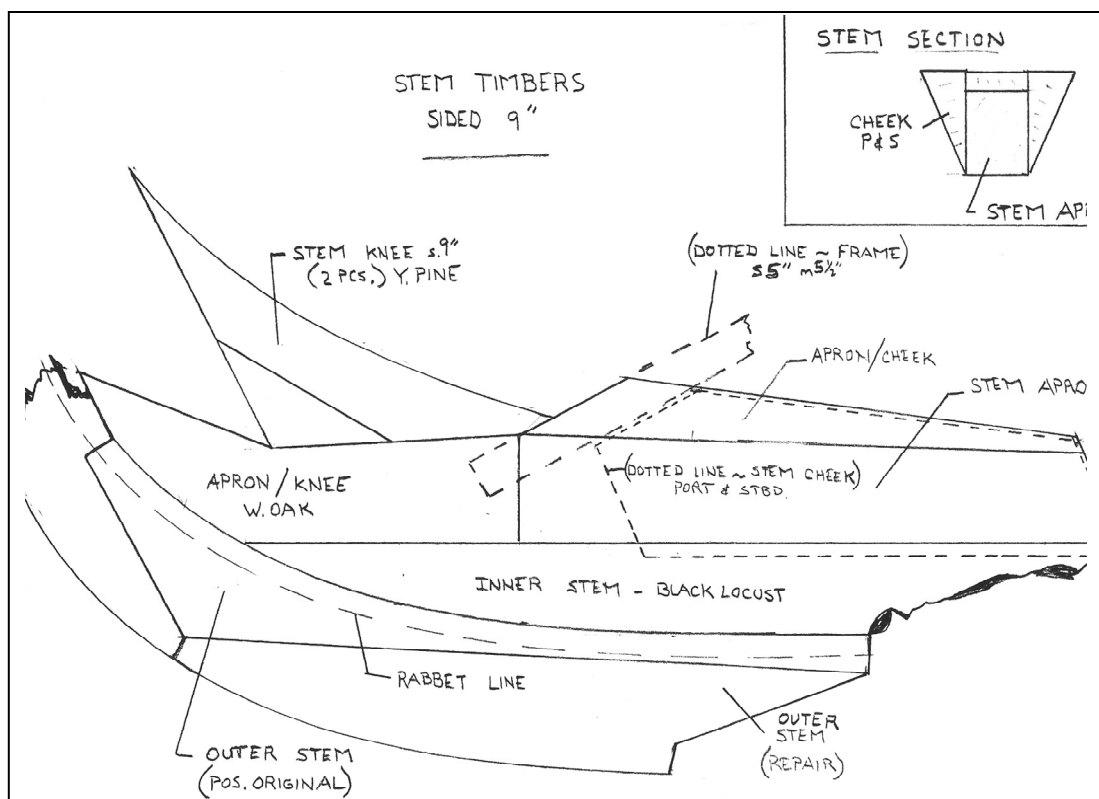


Figure – 15 CORONET Structure of the stem.

As the mid vessel frames are successfully restored there will be an opportunity to address the stem and stern sections. We do not know the condition of the stem (except from exterior inspection) but we assume some rebuilding is required. (Figure 15)

In contrast the stern is very rotten and in need of significant rebuilding. It may be that we will have to discard all of this material and begin a rebuild. As in all of our work we will endeavor to retain as much of the original fabric as possible.

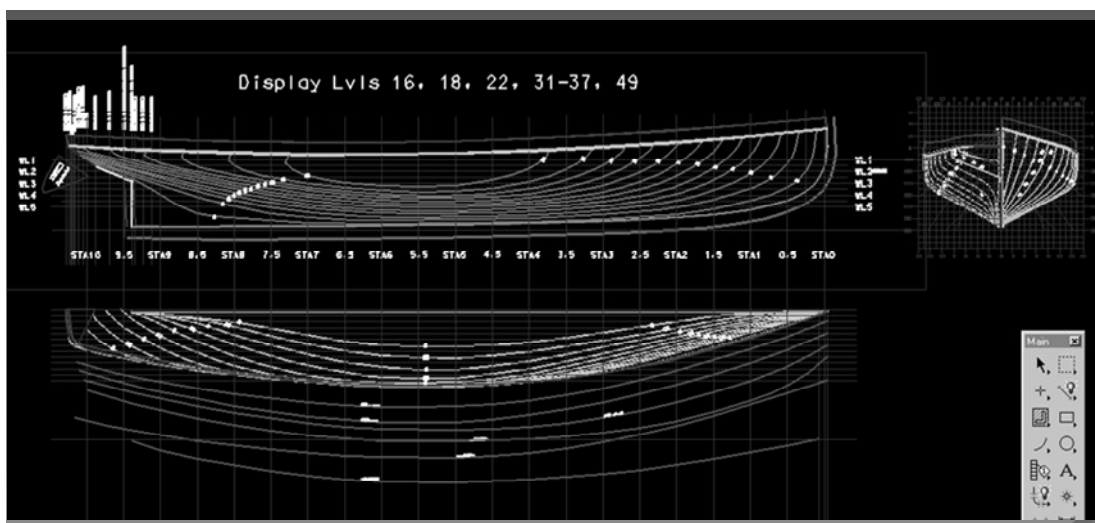


Figure 16 – CORONET Lines as reconstructed.

After this process of protecting the inner wood is completed the ceiling, which has been surfaced and varnished on the interior will be replaced and varnished as appropriate. The work described here will take at least a year.

Once the hull has been re-planked from the exterior the interior will be sanded and varnished six coats to preserve the wood. In the future we will discuss the completion of the decking and interior.

In the West

While this effort is taking place in Newport there will be significant effort taking place in California working on certain cabin and skylight structure. This large timber construction involves precision cutting of dovetails in three inch mahogany timbers of some width. After making the base frames the cutting of the dovetails in the corners will challenge the team.

Over this period the skylights will be completed in the West Coast and delivered to Newport for assembly and installation. By 2012 she may be ready to race?

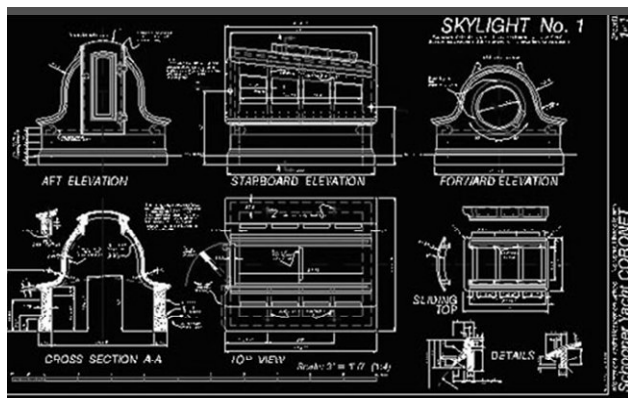


Figure 17 - Plans for a skylight.

CONCLUSION

With some luck and hard work CORONET will have her frames mostly completed by next year. It is estimated that it will take another year to complete the hull and deck.

ABOUT THE AUTHORS:



Robert G. McNeil, a graduate of University of California, Irvine, with a Ph.D in Biochemistry, Molecular Biology and Genetics, is the Managing Director of Sanderling Ventures LLC, a successful seed and early venture partnership. An avid wilderness hiker and ocean racing enthusiast he has many racing accomplishments to his credit including;

North American and Pacific Coast Championships in the 505 Class

In ZEPHYRUS IV first overall and course record 2000 Cape Town to Rio Race and also 2001 Middle Sea Race

In ZEPHYRUS V first in class; first to finish, course record Long Beach to Isla Navidad, Mexico and first overall and course record 2003 Montego Bay Race

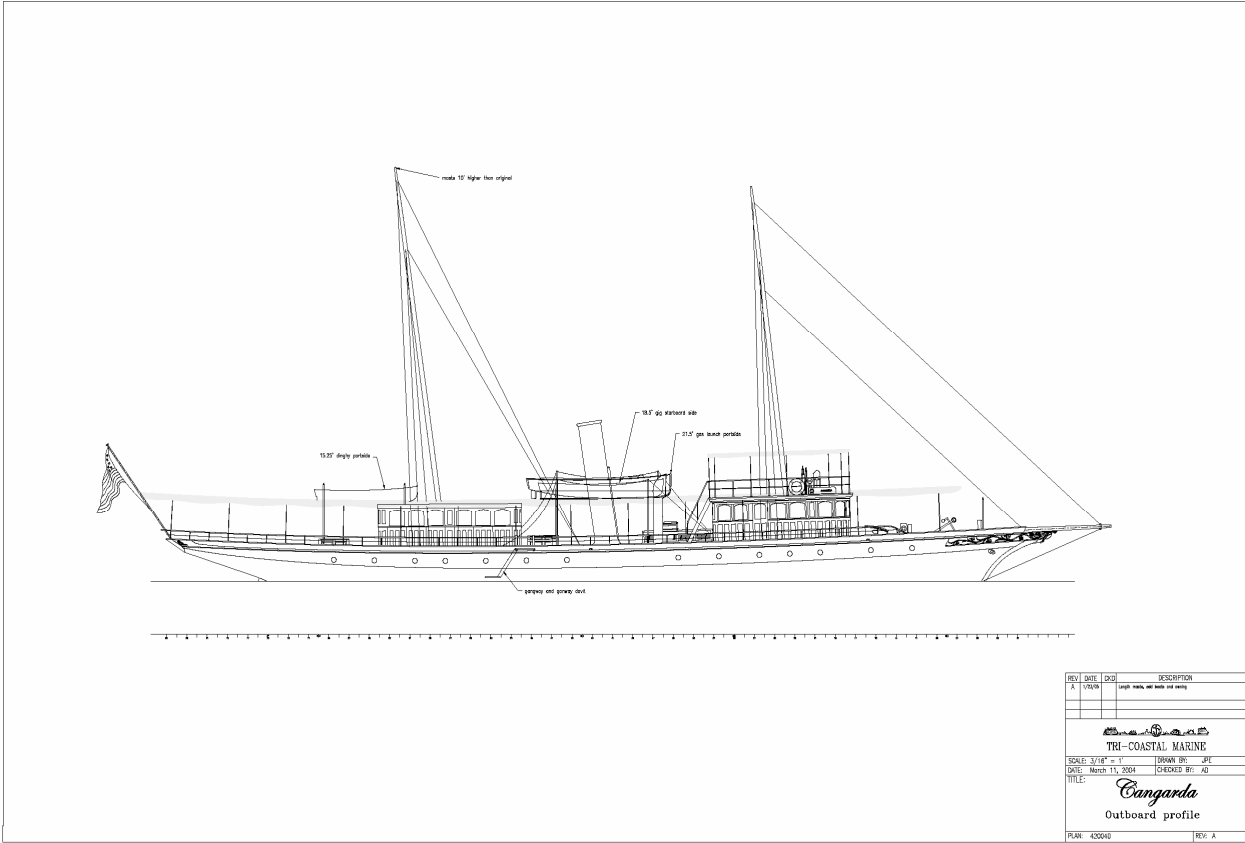
For the past six seasons Bob has raced successfully along the New England coast and France in the restored P-boat JOYANT. He has recently completed the restoration of the 125 foot CANGARDA (1901) and has now turned his focus to CORONET, the last grand American yacht.



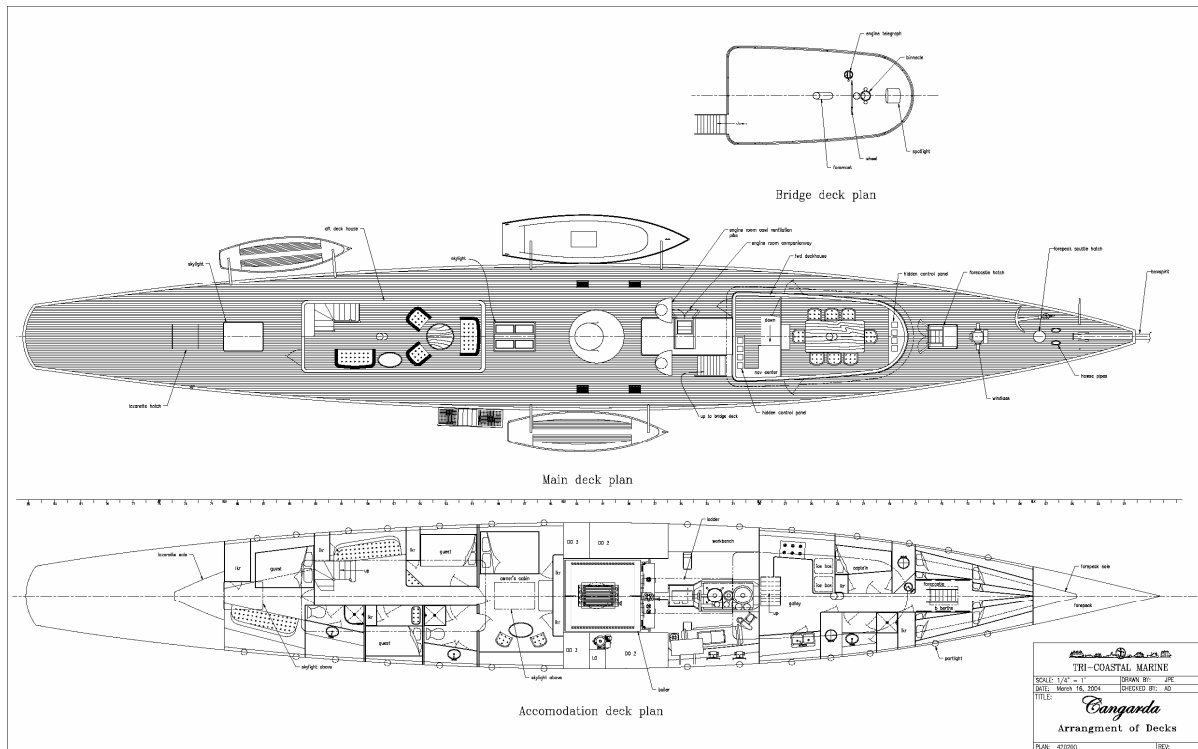
After being laid off from his warehouse job in New York City at the age of 20, **Jeffrey Rutherford** spent a year sailing in a workboat delivering grapefruit around the Caribbean. Watching men build boats on the beach with little more than a handsaw, a hammer and an axe, Jeffrey decided he wanted to try

boatbuilding. He went to Maine in 1976 and apprenticed at the Northend Shipyard rebuilding a 95' passenger schooner. He returned to California where he was born, and after being a union shipwright at Pacific Drydock, he took a job as construction foreman at Pacific Fishboat Co. building a 75' wooden fishing boat. In 1982, after several years of freelance boat repair dockside, Jeff started Rutherford's Boat Shop in Richmond CA. The shop specializes in building and restoring classic yachts and general marine woodworking. Some notable projects include the 53' Edson Shock cutter BRIGHT STAR; the 58' N. G. Herreshoff P-Class sloop JOYANT; a 4-oared lifeboat for the squared rigged ship BALCLUTHA; and an L.F. Herreshoff Buzzards Bay 14.

APPENDIX



A-1 CANGARDA Outboard Profile



A-2 CANGARDA Plan View