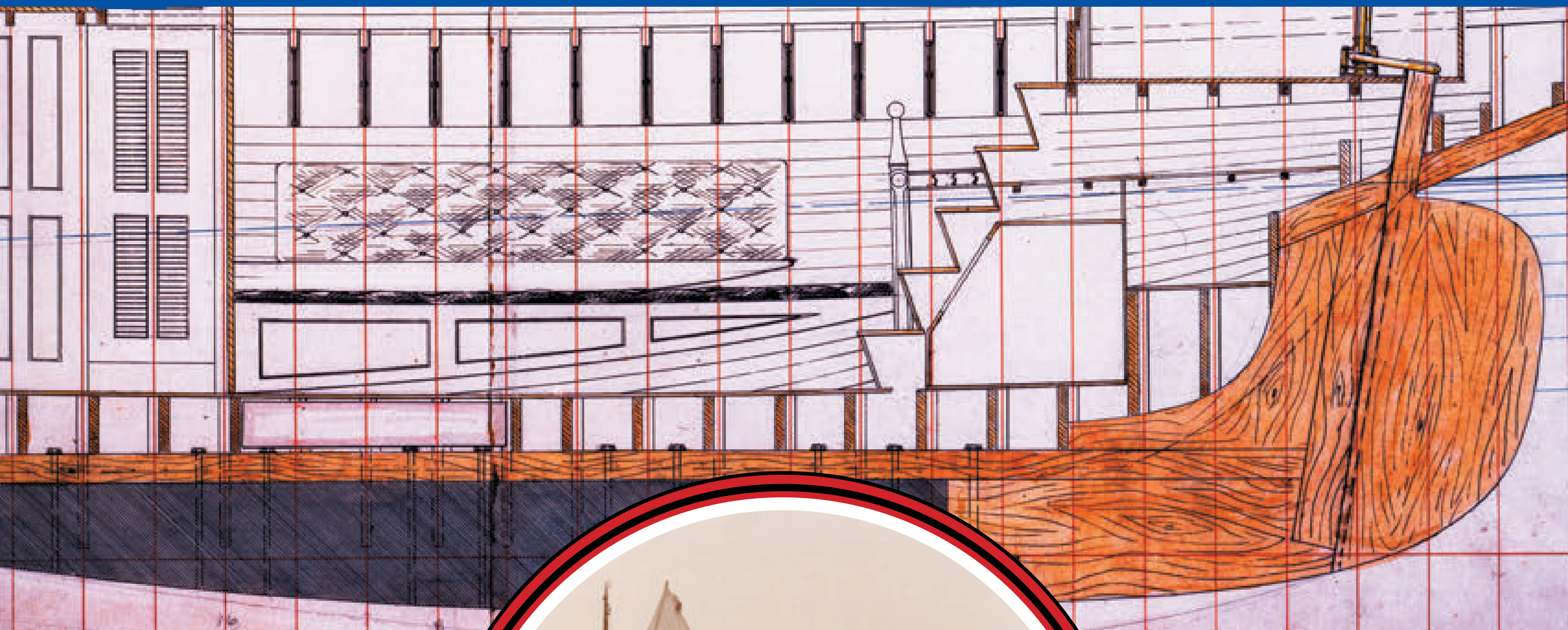
PROCEEDINGS



HERRESHOFF
MARINE
MUSEUM

SOCIETY OF NAVAL
ARCHITECTS &
MARINE
ENGINEERS

THE 3RD CLASSIC YACHT SYMPOSIUM

April 4-6, 2008

Classic Yacht Symposium 2008

Welcome to the Third Classic Yacht Symposium sponsored by the Society of Naval Architects and Marine Engineers together with the Herreshoff Marine Museum. We have been gratified by the palpable service of the last two symposium together with the nearly universal kudos from participants.

As president of the museum, I am grateful for the outstanding Classic Yacht Symposium Committee led by the tireless and dedicated Jan Davison. Museum Curator John Palmieri has been the key to seeking, judging, and editing our outstanding papers. Adam Langerman again provides wonderful skill as designer / editor of the Proceedings.

We provide all of this with no sense of proprietary but rather with an entirely open stance of communal service to the community of classic yacht enthusiasts. Our sponsoring institutions are but two amongst a growing number of quality American institutions to recognize, serve and perpetuate the values bequeathed to us by the golden century of classic yacht design, construction and use. We are privileged to host both professionals and aficionados of our unique and fascinating subject.

Do enjoy the day and do tell us what should be the focus of future Classic Yacht Symposia.

Halsey C. Herreshoff
President, Herreshoff Marine Museum

Dear Classic Yacht Enthusiasts,

Welcome to the Third Classic Yacht Symposium (CYS). The Society of Naval Architects and Marine Engineers (SNAME) is happy and proud to be a co-sponsor of this symposium along with the Herreshoff Marine Museum. The previous two symposia, in 2005 and 2006, were complete successes—technically, artistically and socially. Halsey's enthusiasm and total support, combined with an abundance of knowledgeable authors and the hard-working staff of the Herreshoff Marine Museum, resulted in an unforgettable event. Classic yachts—their history and the skills required to bring them back to life (or keep them preserved) - excite and intrigue all of us who love boats and the sea.

We have made the CYS a permanent part of the varied menu of technical programs sponsored by SNAME. To provide a steady stream of yacht-related symposia for serious boating enthusiasts, we are alternating between the long-standing Chesapeake Sailing Yacht Symposium (CSYS), sponsored (in part) by SNAME's Chesapeake Section, and the Classic Yacht Symposium, sponsored (in part) by SNAME's New England Section. Thus, CSYS is occurring in odd years, while CYS is occurring in even years.

Special thanks for this third CYS go to John Palmieri, Jan Davison and Adam Langerman of the Herreshoff Marine Museum, and Dick Akers of SNAME's New England Section. BZ to all!

Enjoy and Learn!

Robert E. Kramek
President, SNAME

WESTWARD, BRITANNIA, WHITE HEATHER AND SHAMROCK IV at Cowes by Tony Blake

CLASSIC YACHT SYMPOSIUM 2008

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CLASSIC YACHT SYMPOSIUM 2008

DEAR CLASSIC YACHT ENTHUSIASTS,

WELCOME TO THE HERRESHOFF MARINE MUSEUM/SNAME THIRD CLASSIC YACHT SYMPOSIUM AND THE HISTORIC TOWN OF BRISTOL. BRISTOL IS CLOSELY LINKED NOT ONLY TO BOAT-BUILDING BUT ALSO TO THE QUEST FOR THE AMERICA'S CUP. EIGHT CONSECUTIVE AMERICA'S CUP BOATS WERE BUILT BY THE HERRESHOFF MANUFACTURING COMPANY IN THE NINETEENTH AND TWENTIETH CENTURIES. BRISTOL IS ALSO HOME TO GOETZ CUSTOM SAILBOATS, BUILDERS OF MORE RECENT AMERICA'S CUP BOATS. TAKE TIME TO EXPLORE THE MUSEUM'S WATERFRONT, HOME OF "PEACOCK ALLEY" FROM WHICH PROMINENT AMERICA'S CUP BOATS WERE LAUNCHED. OUR PRESENT SITE HOUSES THE AMERICA'S CUP HALL OF FAME AND WILL BE HOME TO THE PROPOSED NEW AMERICA'S CUP HALL OF FAME. IT IS AN EXCITING AND PIVOTALTIME FOR THE HERRESHOFF MARINE MUSEUM AS WE EMBARK UPON A MUSEUM EXPANSION PROGRAM MADE POSSIBLE BY A RECENT FEDERAL DOT GRANT.

DURING THE COURSE OF THIS WEEKEND, WELL KNOWN YACHT RESTORERS, NAVAL ARCHITECTS AND MARINE ENGINEERS WILL TELL THEIR STORIES. THEIR PRESENTATIONS ARE THOUGHT PROVOKING AND TOP NOTCH. WE REMAIN RESOLUTE IN BRINGING THE BEST OF WHAT CLASSIC YACHT RESTORATION HAS TO OFFER AND WE ARE GRATEFUL TO OUR DEVOTED, ENTHUSIASTIC AND LOYAL FOLLOWING..

THIS EVENT WOULD NOT BE POSSIBLE WITHOUT THE CLASSIC YACHT SYMPOSIUM COMMITTEE. THEIR EXTRAORDINARY EFFORTS AND CEASELESS GOOD CHEER CONTINUE TO INSPIRE US ALL. I SALUTE HALSEY HERRESHOFF, PRESIDENT OF THE HERRESHOFF MARINE MUSEUM FOR HIS BRILLIANT INSIGHT AND ACTIVE PARTICIPATION IN THIS EVENT. OUR CURATOR, JOHN PALMIERI IS RESPONSIBLE FOR THE PAPERS ASPECT OF THE CYS AND WITHOUT HIS DETERMINATION AND RELENTLESS ATTENTION TO DETAIL, THIS EVENT WOULD NOT BE POSSIBLE.
THANK YOU TO OUR SATURDAY VENUE HOST, ROGER WILLIAMS UNIVERSITY LAW SCHOOL, OUR GENEROUS SPONSORS, MODERATORS ROGER COMPTON AND ROGER MARSHALL AND VOLUNTEERS. PHIL KIMBALL, EXECUTIVE DIRECTOR OF SNAME HAS BEEN AN ENDLESS SOURCE OF IDEAS AND MARINE EXPERIENCE. THANK YOU TO ADAM LANGERMAN FOR OVERSEEING THE PUBLICATION OF THE PROCEEDINGS BOOKLET.

WHILE BOAT RESTORATIONS ARE OFTEN MEASURED IN TERMS OF RAW MATERIAL AND MAN HOURS, THE JOURNEY IS OFTEN FAR MORE PERSONAL AND INTANGIBLE. SOME OF US HAVE DISCOVERED IT IS ALSO ABOUT THE NOTION OF RENEWAL, HOPE AND A NEW BEGINNING.

THANK YOU FOR ATTENDING CYS 2008. PLEASE JOIN US FOR THE FOURTH CLASSIC YACHT SYMPOSIUM IN 2010.

CHEERS,

JAN DAVISON
CHAIR
CLASSIC YACHT SYMPOSIUM

The Classic Yacht Symposium 2008

Carlo Sciarrelli and His Yacht Designs

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ABSTRACT

Carlo Sciarrelli (Trieste, 1934-2006) drew 140 designs during the four decades of his career as a yacht designer, from which more than 400 yachts were built. Among these, the largest part is made up of wooden sailing yachts. Even if the first boats that were built in the sixties for cruising and racing and that followed the RORC rules are completely different from the very last yacht built in 2002, all of them are characterized by his unmistakable style. In the present paper, the figure of Carlo Sciarrelli as yacht designer is outlined, with an emphasis on his work methods and his unusual "universal" knowledge in the field of the history of yacht design. This point is well represented by his book *Lo Yacht* written in 1970, and updated in newer editions up to 2006, unfortunately never translated into English. Then, a selection of yacht designs will be presented, where the most successful boats (at least in the authors' estimation) will be analyzed and commented on. Among them, there are some day-sailers, cruisers, performance-cruisers and some racers. All these boats share some characteristic features of Carlo Sciarrelli's designs. First of all, a continuous research towards yacht sailing with little resistance, and consequently needing little power to sail fast. Secondly, a hull shape that makes the yacht's behavior smooth and safe, with a nice self-steering attitude. Thirdly, state of the art construction (often in cold molded wood), strong but not over-overdimensioned, so as to obtain a reasonably light displacement, even with an "old" and "low tech" material such as wood. Last, but not least, a personal, very elegant style. It is believed that the designer's style along with the very high level of builders' craftsmanship make these boats masterpieces that will be a pleasure to look at and to sail for long time to come.

INTRODUCTION

Carlo Sciarrelli died in 2006. He was a totally original designer in today's yachting community. His distinct character meant that he was self-educated to an unusual level of erudition and knowledge in the field of naval architecture (not only this, he read in Latin, he knew everything about music, and much more...). This, along with his natural "eye for a yacht", allowed him to design a number of truly classic vessels.

After a description of the man Carlo Sciarrelli, we will talk about his activity as a designer, and then we'll present a selection of his designs, which we think to be representative of his production. There is much written material, written by Sciarrelli and about Sciarrelli, almost all in Italian. For this reason, when describing the yachts, we often quoted Sciarrelli's words, which are always very clear and vivid, accompanied by his *verve* and controversial style.

THE MAN

Carlo Sciarrelli (1934-2006) designed about 140 boats in 40 years, from which were built about 400 yachts. Even if some boats took part in international races (like the Observer Single-handed Trans Atlantic Race, OSTAR) he remained essentially a designer for Italian customers. In Italy, all sailors know the name of Sciarrelli, even if in today's industrially developed nautical market a production of 400 boats is not much. But all these creations are well characterized, and very different from production boats.

Born in Trieste in 1934, on the uppermost corner of the Adriatic Sea, Sciarrelli's love of sailboats began at a very young age. During the years after the second World War, he began sailing on a Snipe, which he had restored

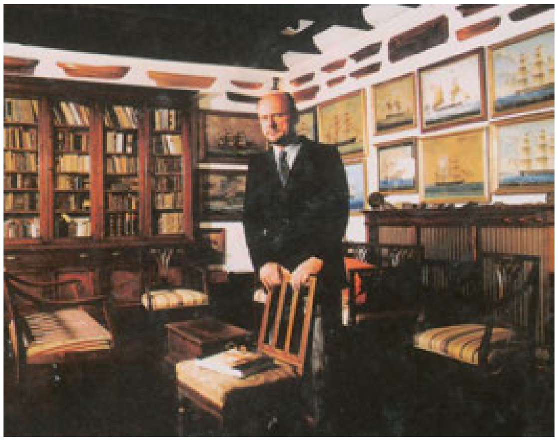


Figure 1: Carlo Sciarrelli

Figure 2: BAT, Sciarrelli's personal yacht. It is a 17 foot English cutter built in 1889.

himself. At first he worked as railway-man, like his father, but the passion for yachts and yacht design, along with an uncommon attitude for investigation drove him to the study, observation, and contemplation of how a sailing yacht "works".

When he was 24 he bought an old 20 foot *passera*, a typical small boat common in the Adriatic Sea, that he modified for racing. After a couple of years he was ready: he completed the first design, ANFITRITE, a RORC racing yacht of the C class, the smallest class entering offshore races. ANFITRITE was launched in 1960. She had no engine, and was very successful. In 1964 he received the first order as a professional designer, for AGLAJA. Again this was a RORC racing yacht, but very different from the first. She was a very original design, and represented the first of a series of boats which Sciarrelli defined as being *zeitlos*, timeless. The *Yacht Club Adriaco*, the oldest yacht club in the Adriatic Sea and the most important sailing club in Trieste, is the place where the young designer began to be known and appreciated. Its name and his designs were increasingly recognized, first in Trieste, then in the North Adriatic. The success of the first designs attracted new orders, the name Sciarrelli became more and more important. At that time, we were still, in Italy, in a pre-industrial era in the nautical market. GRP yards were very few, and most of the yachts were wooden built by traditional yards. Many of these yards were in Trieste, where the designer lived. The yachting movement at the end of the sixties was growing rapidly, and yacht design developed very quickly too. The new *racing machines* designed by the Americans Dick Carter and Olin Stephens were somewhat revolutionary, having a new profile with fin keel and separated skeg and rudder. Also Sciarrelli's production followed this line of development, with a couple of years delay: at the end of the sixties he designed his first yacht with fin-keel and separated rudder. Then he produced some racing boats for the I.O.R. rules, which were introduced in 1970, replacing the RORC. Some of his one tonners were very successful, we are still in the very first years of the I.O.R. era, when the rule was not yet producing forced and type-formed hull shapes.

In 1969 he wrote *Lo Yacht - Origine ed evoluzione del veliero da diporto*, a 400 page book about the history and development of the sailing yacht. It became a best seller in the nautical book market, and was considered a *cult book*, with many readers discovering a new way of talking and reasoning about yachts, analyzing their behavior, their shape, and putting them within an historical background. It has been reprinted in 6 editions, periodically updated by the author, and is still a success after 38 years. It was translated into German very early on, while unfortunately it has never been translated into English.

In 1972 he received an order that made him change his style: SAGITTARIO. The Italian Navy ordered it for racing in the 1972 OSTAR. It was a cutter, 52 feet long: ordered at the very last moment, and then built in 78 days (!); it scored third in the monohull fleet after the famous VENDREDI TREIZE (100 feet) and BRITISH STEEL (60 feet). She was then penalized 18 hours due to a delay in completing the 500 miles for qualification. Looking today at this boat, one is surprised by the hull proportions: she is truly a ULDB, 8.5 ton of displacement over 52 feet of length! The shape of the sections does not change very much from the preceding designs, but all the boat is *stretched*, becoming fine and light, very light. With that design Sciarrelli became a very modern designer, yet retaining a personal and somewhat *classic* style and appeal.

In Italy the Seventies was a decade of big industrial development for the nautical market, a lot of yards started producing GRP boats. Sciarrelli designed some (few) boats for GRP series production, but this logic conflicted with his view of the craft of yacht designer, as a tailor who cuts the cloth for a suit made to measure on the basis of strictly personal wishes. By the end of the decade

Figure 3: ANFITRITE.

he had severed any links with industrial production. After SAGITTARIO he continued designing *ocean racers*, among them CHICA BOBA II, a 56 foot aluminium cutter, which scored second of the monohull fleet in the OSTAR in 1980. At the beginning of the Eighties, the era of ocean races, raced with normal (cruiser-racers) yachts was coming to a close, and his production from there was devoted almost entirely to cruising yachts, which he defined *barche per viaggiare (boats for sailing, voyaging)*. He also designed some day sailers, some catboats, and some motor boats. The most part of his production was of boats ranging between 30 and 60 feet.

In 1984 the city of Trieste, for the *Trouver Trieste* exhibition, held at Centre Pompidou in Paris, dedicated a room to him, with an exhibit of designs and models. Moreover, recognized him with a documentary about his work as a yacht designer.

In 1993 Sciarrelli began suffering from a rare disease, that forced him to reduce his activity. He restored some veteran boats: among them MOYA, a 45 foot William Crossfield cutter of 1910, TIRRENIA, a 60 foot Sheperd ketch, SORELLA, a 28 foot Itchen ferry of 1858. The orders for new designs were less compared with the past, but the quality increased, and during this period a good number of beautiful yachts were launched.

In 2003 the University of Venice awarded him with an honorary degree *honoris causa* (after having given the same honour to Olin Stephens eleven years before, in 1992). In Trieste there takes places annually the *Sciarrelli Cup* regatta, where entries are Sciarrelli designed boats only.

Figure 4: AGLAJA.

He died on September 23rd 2006.

In 2007, a year after his death, the city of Trieste organized an exhibition about him, his designs and his yachts, at the local Maritime Museum.

THE YACHT DESIGNER

Sciarrelli's way of designing a yacht can be understood by his words in answer to the question "What is your aim in designing a boat?": *"I search a boat which has little resistance, and which is awesome"*. His aim, when developing a theme proposed to him by a customer, was to wholly satisfy the future owner, although remaining inside the "rules" of his philosophy. *"My search has always been that of a hull with less resistance. Such a hull needs less sail and less horse power because it has a fine shape, and needs a lower mast, and less ballast. A yacht that needs few changes of foresail, that has a mast standing without runners, that sails well in light winds with small jib and staysail as foresails. A boat that can be sailed by the owner and his family without the help of gorillas"*. It is somewhat an opposite approach compared to the current way, where the research is almost always toward more power (more sail, more stability), not toward less resistance.

The lines of his designs, the scantlings and many other things were developed after a deep historical study, where he analyzed every small detail of any existing boat, from

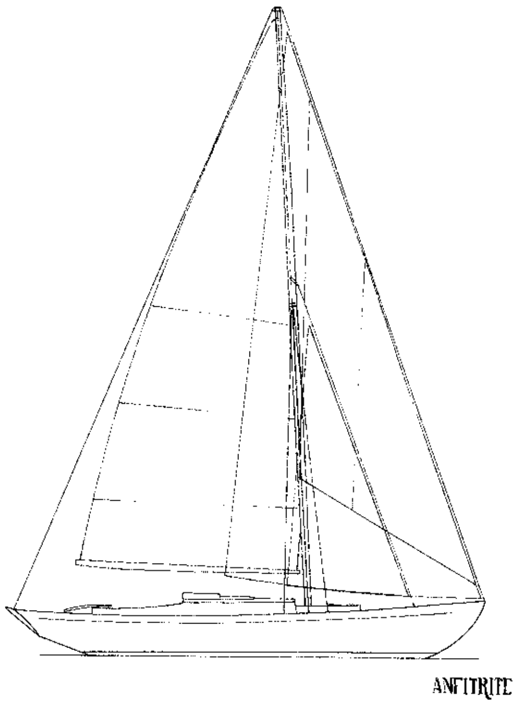


Figure 5: ANFITRITE.

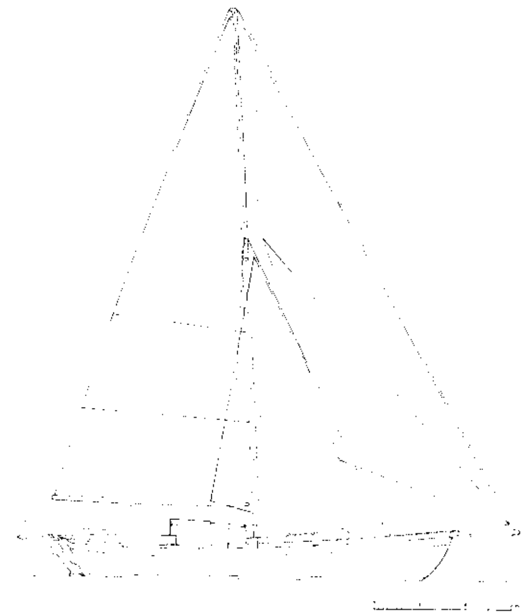


Figure 6: AGLAJA.

the sailing ship to the fisherman schooner, from the Baltimore clipper to the pilot cutter. Everything was understood, classified, interpreted with the skill and freedom of a self-made education. From his library of 1000 volumes of naval architecture he synthesized the evolution of hull shapes, of building systems, of rigging, and so on. His boats reflect this profound knowledge, that added to a natural talent and eye for beauty, result in an original and personal style, classic but not old, modern but elegant, traditional but not nostalgic. Like a new Palladio, even if the comparison may seem exaggerated (Andrea Palladio 1508-1580; famous Italian architect for which the Palladian style is named), he read old themes, and with the knowledge of a poet that plays with rhymes and accents of his lyrics, he mixed and put them within new shapes, shapes that retain an undoubtedly *classic* feeling.

Talking now about hull shape, one can notice a constant research towards balanced shapes, of the kind that give a reliable behavior of the boat under sail. Round sections at the bow, V-shaped near the stern. Waterlines that have an ancient long tradition in the oared ships (remember Venetian *galee*!), they are nevertheless modified and adapted to the extra power given by a modern sailplan. This is a common feature of very different types: the small daysailer, the modern cutter, the traditional long-keeled one, the schooner, the ocean racer.

"The first time I began thinking about what keeps a boat stable on its course when going fast, was something I experienced when I was young, in Venice[...]. We had finished a Snipe regatta, and one of our boats, after the race, was given to a fishing boat, that was supposed to tow it to Trieste. The fishing boat was going at more than eight knots, and I knew from experience that at that speed the Snipe was impossible to steer. I was surprised by the simplicity with which the fishermen's practice solved the problem. Without any previous test, they took a big stone from the harbour, which was put near the stern. The boat was then towed and followed the fishing boat like a goose. This is the explanation. A boat keeps the course if the stern is heavy when going fast. And this is done automatically by the boat that has the aft sections more V-shaped than the fore ones, while if the fore is deep and the aft is flat, the bow will tend to submerge and the stern will rise..."(Sciarrelli 1969)

He always designed alone, without any employee, and without any computer. He didn't use splines either, only curves and sweeps, somehow like the old yards of the Adriatic Sea, who were used to building boats using the *seste*, a set of curved shapes from which all the sections of the boat were derived, without any preliminary design. He didn't have an office, the *office* was at home, in a room with a table with a magnificent view of the Gulf of Trieste. He summarized within complicated diagrams and plots (difficult to decrypt!) his analyses, from the mast dimensions, to the freeboards, from the rigging to the frames etc.... They are plots where one can find boats built since XVIIIth century up to today. On those diagrams, year after year, the "Sciarrelli type" line found its place, the line that defined his choice for his boat types.

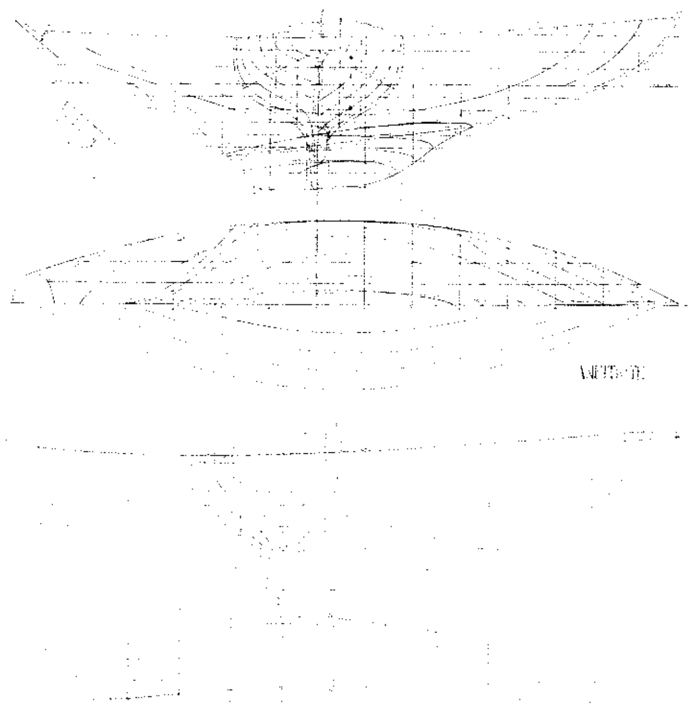


Figure 7: Lines of ANFITRITE (above) and AGLAJA (below)

A CHOICE OF DESIGNS.

Here we will present some of his designs. The choice, we think, well describes his production. He divided all his designs within two big families, the *modern* one and the *traditional* one. All were descendants of the two parents, design number one ANFITRITE for the modern, design number two AGLAJA for the traditional.

While the family of modern types follows, even in a personal way, the historic path of evolution of the period where they were born, this is not the case of the traditional types. These are timeless creations. It is worth noting that he called *yachts* the modern ones, while the traditional were simply named *barche* (boats). Boat is more generic than "pleasure boat" (yacht). It can be also associated to a pilot cutter, or to a fisherman schooner.

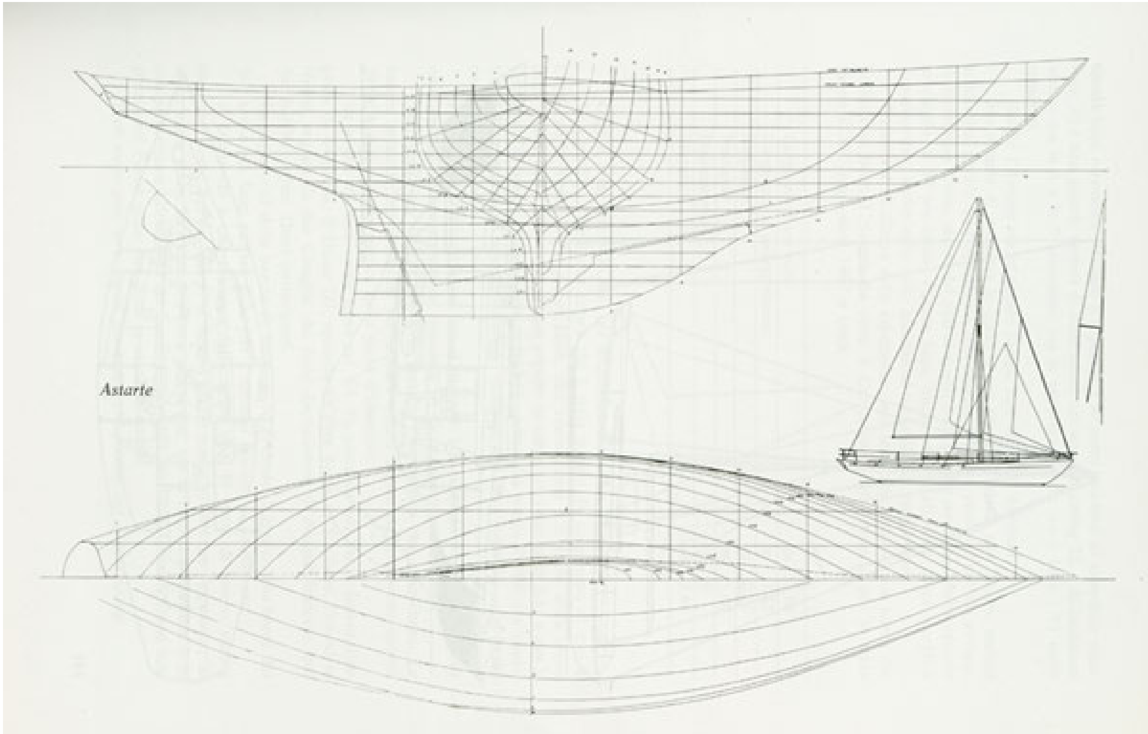
For most of them we will quote comments made by Sciarrelli himself, which well describe them in his book *Lo Yacht* and in numerous other interviews and articles.

Yachts

ASTARTE - n.8, 1966

"[...] Another third class thought for the Adriatic is ASTARTE that I designed in 1966 for professor Mandruzzato of Trieste. The theme was to produce a boat that was simple, efficient, suited also for light winds and very good

Figure 9: ASTARTE



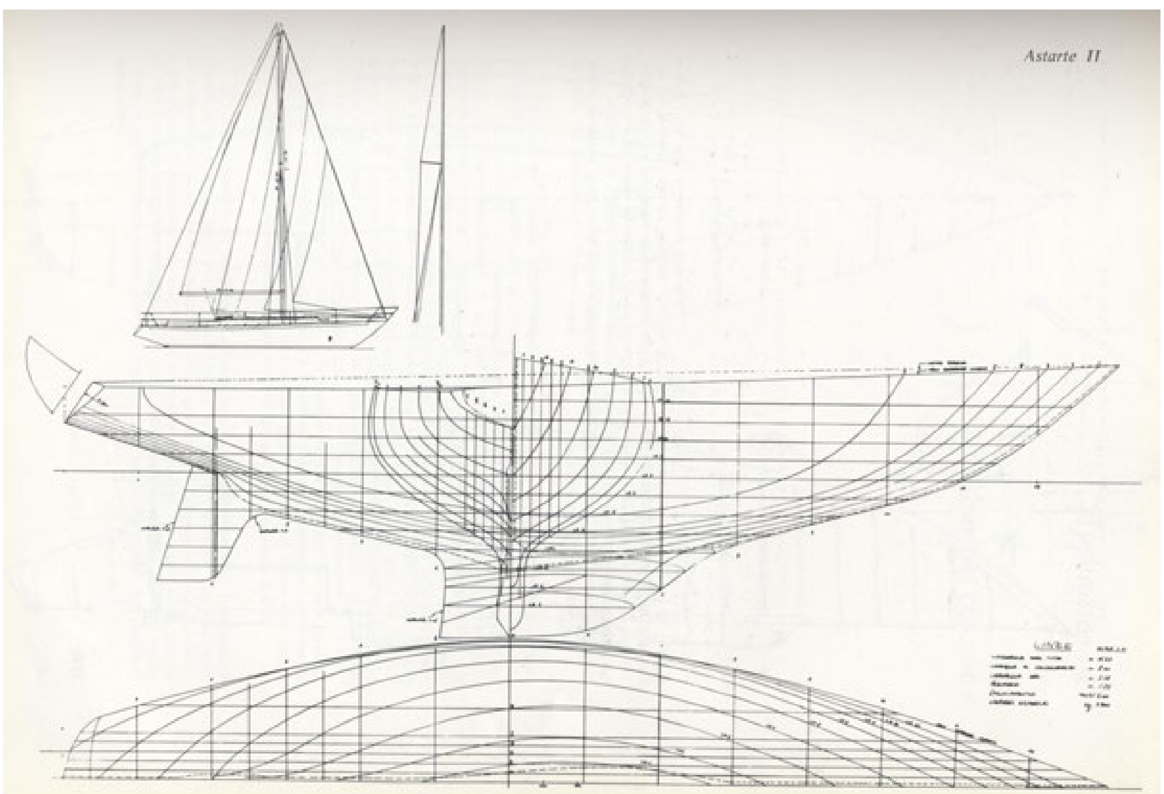


Figure 8: ASTARTE (above) and ASTARTE II (below)

specifically upwind. With the class limit at 22.5 feet it is very difficult to make a boat for light winds relying on a big sail area. With the last RORC rating the third class boats rarely pass 50 square meters of measured surface. There is a big variety in dimensions among the third class boats of 22 feet rating, the displacements range from 4 to 7 tons, but the sail areas are between 46 and 52 square meters. ASTARTE lies in this range too with 48 square meters. I tried to produce the most suitable hull for sailing close to the wind, almost round and balanced sections, a short keel, a fine waterline entry profile, medium displacement, overhangs like the metric boats. A lot of ballast in the keel, about 50 percent. A small cabin trunk, essential interior arrangements. A simple and manoeuverable boat, well suited for the variable conditions of our sea. She gave what we expected, I've never been on such a good boat in sailing upwind. ASTARTE won the Adriatic Italian Championship in the RORC third class in 1967 and 1968."

Length over all	m.	10.80	(35.4 ft)
Length at waterline	m.	7.32	(24.0 ft)
Beam max.	m.	2.70	(8.8 ft)
Draft	m.	1.60	(5.25 ft)
Displacement	tonn.	5.0	(11020 lbs)
Ballast	tonn.	2.45	(5400 lbs)

ASTARTE is representative of the first designs, where the influence of the RORC rule was important. Among all racing yachts of those times, Sciarrelli liked very much some racers designed by Robert Clark (like FAVONA, ORTAC, JOCASTA) whose influence is noticeable also in the ASTARTE hull lines.

Figure 10: ASTARTE II

ASTARTE II - n.23, 1969

"[...] I designed it with the new formula and represents a moderate version of a One Ton, reinterpreted with an IOR eye. She is not an extreme boat, with the new rating rule it would be possible to obtain a yacht capable of higher top speeds, lighter, with wider stern. It has been maintained with finer lines, more classic, with the aim of having a good light wind attitude. She has quite a lot more sail area compared to a 22 footer of the year before, she has 15-20 percent more sail area, and is 10-15 percent lighter. The stern slightly larger, the bow slightly pinched. ASTARTE II won the Adriatic Sea Championship in IIIrd class IOR in 1970."

This boat marks the transition from the long keelers to fin keelers with separate rudder. The general look is new, the freeboard is higher, the stern is wider, the sailplan has a huge genoa for light winds. Nevertheless the hull shape is not new, she is not very different from the elder sister ASTARTE, sharing a moderate beam with round and balanced sections, a fine waterline entry profile, nice overhangs (with a new reverse cut of the stern), a lot of ballast, almost 50 percent. The boat was very successful, raced a lot in the Mediterranean, winning the Mediterranean Championship in 1971. From this, four other OTC design were derived, which also proved to be very good boats.

Length over all	m.	11.27	(37.0 ft)
Length at waterline	m.	8.00	(26.2 ft)
Beam max.	m.	3.08	(10.1 ft)
Draft	m.	1.75	(5.75 ft)
Displacement	tonn.	6.0	(13224 lbs)
Ballast	tonn.	2.90	(6390 lbs)

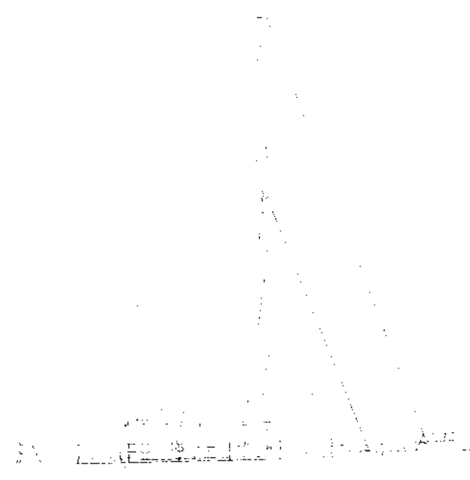


Figure 12: SAGITTARIO

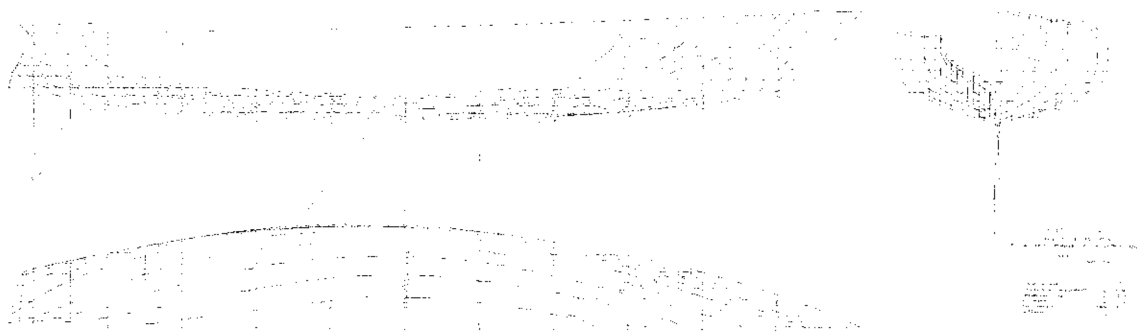


Figure 11: SAGITTARIO

SAGITTARIO - n.39, 1972

As stated by Sciarrelli, SAGITTARIO is the narrower and lighter, slender version of the boat with a clipper ship shape, suited for sailing fast while keeping its course self-steering. Because of the terrible purpose from which she originates,that is,sailing the Atlantic racing singlehanded, having also multihulls as competitors, he had to choose a very light displacement in order to minimize the sail area while retaining the high speed capability. Length and lightness are important speed factors, and were enhanced to the detriment of the rest. She is an extreme hull, with unusually low displacement/length ratio. The shape of the hull is such that it enhances the course keeping ability. Round bow, stern nearly V-shaped. Waterlines as long and fine as possible, any volume aft of midsection where a wave can grasp was removed. *"This means removing the planing attitude, SAGITTARIO will may be never have those* bursts of speed *which are celebrated in the nautical press when talking about light displacements. I considered a minus for a boat built for a singlehanded passage the planing attitude. Heaven help if SAGITTARIO, alone and without any limit, would go for eighteen, twenty knots. Inevitably, I believe, without anyone steering, it will end up a luff that, with sea conditions corresponding to the speed and only one man on board, it frightens me only thinking of it."*

Length over all	m.	15.45	(50.7 ft)
Length at waterline	m.	13.95	(45.8 ft)
Beam max.	m.	3.68	(12.1 ft)
Draft	m.	2.20	(7.22 ft)
Displacement	tonn.	8.50	(18730 lbs)
Ballast	tonn.	3.75	(8265 lbs)

It must be said that sailing reports partially contradict the designer's concern: sailors who sailed the boat in strong winds experienced an unusual ability to maintain course combined with very high, planing speed (which is not difficult to believe looking at the displacement/length ratio). SAGITTARIO held for many years the record of the *Brindisi-Corfù* race, a 120 miles race which crosses the Ionic Sea from Italy to Greece.

Figure 13: SAGITTARIO

CHICA BOBA II - n.78, 1978

Length over all	m.	17.00	(55.8 ft)
Length at waterline	m.	13.50	(44.3 ft)
Beam max.	m.	4.00	(13.1 ft)
Draft	m.	2.70	(8.86 ft)
Displacement	tonn.	15.00	(33060 lbs)
Ballast	tonn.	7.50	(16530 lbs)

CHICA BOBA II was designed for Edoardo Austoni, who ordered her for winning the OSTAR. She was born as a "state of the art" cutter. Built of aluminium, she was designed with the Northern Atlantic sailing conditions in mind: strong wind, often close hauled sailing. She is quite a narrow boat, with low superstructures and low freeboard. A modern cutter rig carries a well developed sailplan, contrasted by a deep lead keel, with 50 percent of the displacement within. The profile is nice, with long overhangs. A lower prismatic coefficient keeps more volume in the midship region, thus giving the boat a sweeter behaviour in heavy sea. She performed very well in the 1980 edition of OSTAR: 2nd in the monohull fleet and seventh overall. Austoni broke two fingers during the race, and left the boat essentially self steering for a long time before being fully able to sail her again.

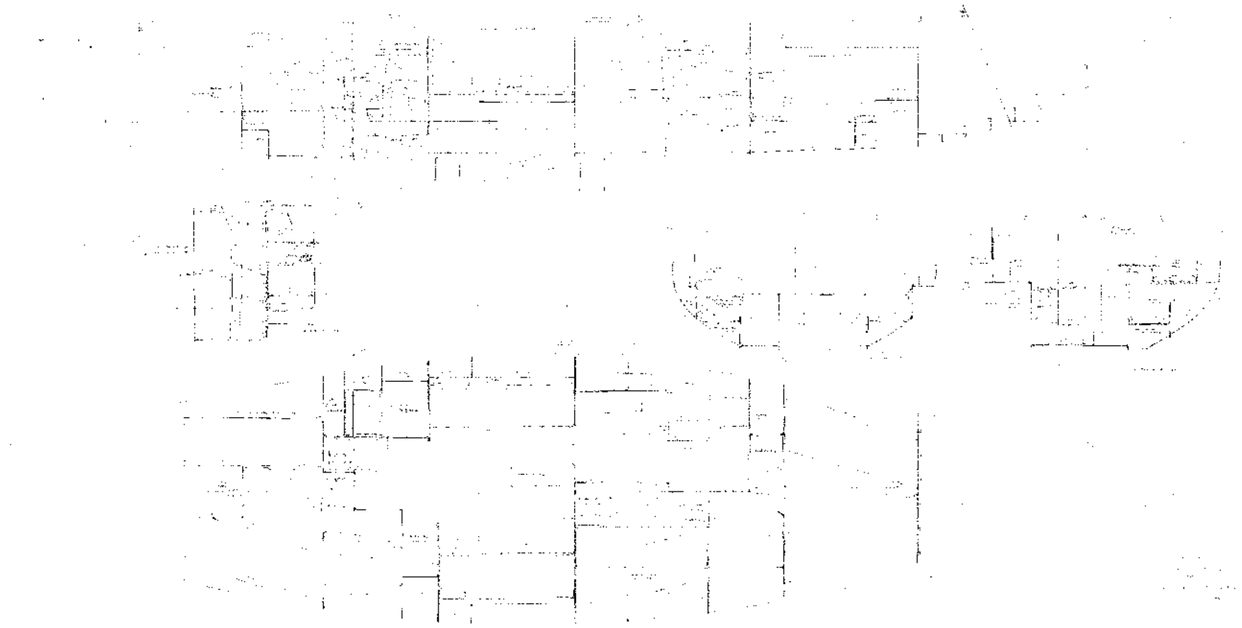


Figure 15: CHICA BOBA II

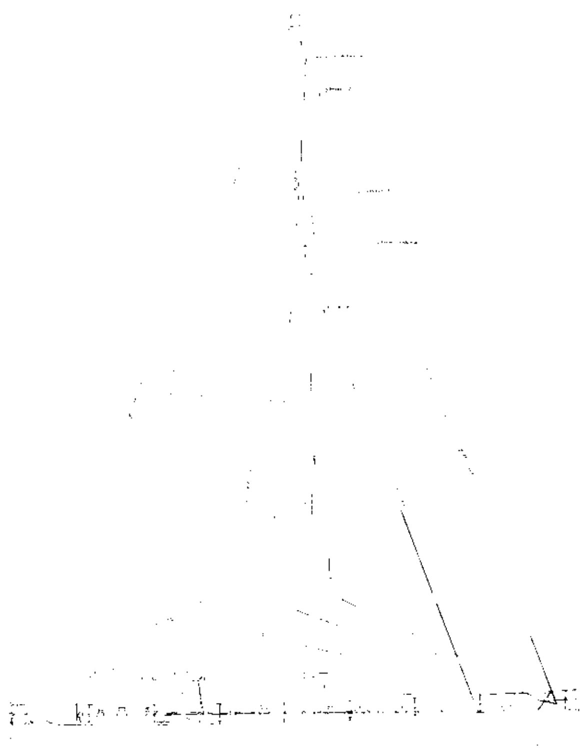


Figure 14: CHICA BOBA II

Figure 17: CHICA BOBA II

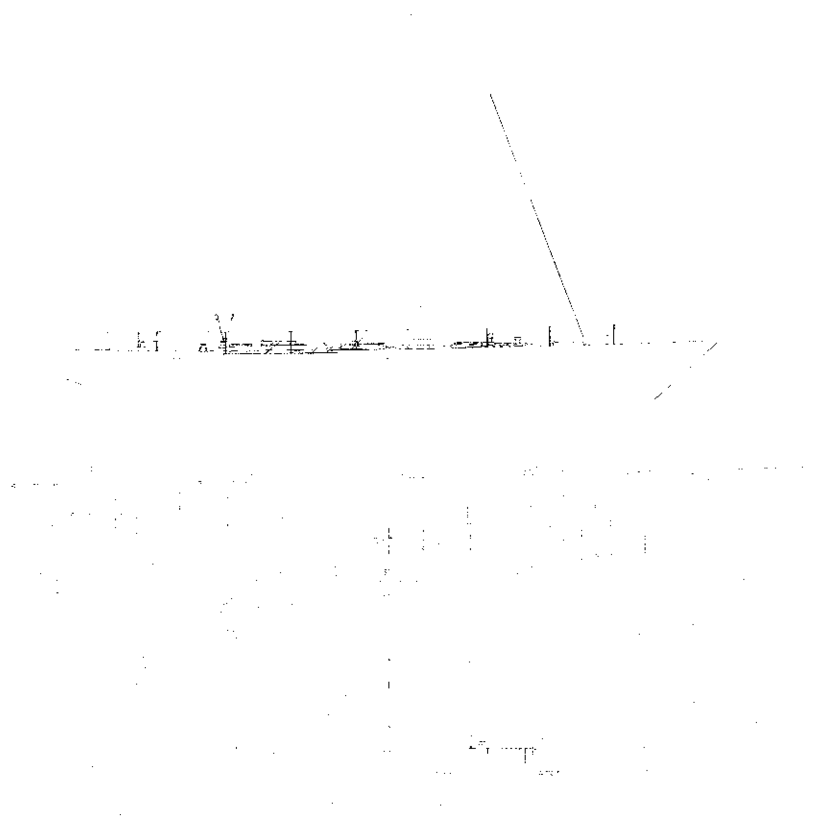


Figure 16: ANGELICA III

ANGELICA III - n.109, 1986

..."Regarding the aesthetic side, modern is questionable and never coincides with elegant. King George V on board of BRITANNIA was a modern yachtsman of his time, BRITANNIA was a modern yacht and won many races, and everything was extremely beautiful and elegant. The equivalent modern yachtsman owns a maxi and wins races, but he is clothed like an astronaut, his boat is a block of metal or plastic full of ruthless looking technology. An industrial, space, missile look.

But, this is my cry of sorrow, why should a modern yachtsman not be elegant? I take care of him, I respect him and I try to give him the elegance that current times reject.

If there is a last shelter for elegance in this world, why cannot it be the modern yacht? [...] The other boat is ANGELICA III, of 18 meters. Yacht just launched and with the imprinting of elegance, her class imposes overbearingly. There is no discretion in the impact of this yacht compared to other boats. No match."

Sciarrelli's descriptions go into construction details: the hull is of varnished wood, deck with traditional superstructures, skylights, a very low rectangular cabin trunk.

Figure 18: ANGELICA III

But everything with a modern style, the most possible linear and simplified.

Wooden mast. Almost 22 meters from deck, with one set of spreaders. It is by now a geometry well tested on a number of boats, some of them sailed around the world. You give tension to the shrouds when you put the mast, then another tensioning after the first sailing, and then you forget it, nothing will happen. And without hydraulic pumps and runners.

"For obtaining such a yacht a good design is not enough. A complete commitment of owner, yard and designer is needed, and they have to be of the proud type that makes anyone of them think that he is the determining one. If there is this tension the result is superb.

With this yacht I boast of having invented the modern yacht: elegant like the old one. It is a presumptuous declaration, but I express it firmly, as an ethic statement of my activity. [...] ANGELICA continues, and for the moment closes, the sequence of important yachts presented as living characters in all this book. Continues, I say it with perfect consciousness, the history of the art of yachting."(Sciarrelli 1969)

Length over all	m.	18.00	(59.0 ft)
Length at waterline	m.	15.65	(51.3 ft)
Beam max.	m.	4.25	(13.9 ft)
Draft	m.	2.73	(8.96 ft)
Displacement	tonn.	19.25	(42425 lbs)
Ballast	tonn.	8.50	(18730 lbs)

ANGELICA III is probably the most perfect realization of what Sciarrelli conceived as the modern yacht. The lines are clean, without any deformation due to rating rule. She is narrow, long and moderately light, with a trapezoidal keel and separate rudder with skeg. The freeboard is very low, the deck is spacious and clean. The rig is cutter with yankee and staysail as "working" sails. Beside its beauty, the boat proved to be very fast, competing in the early nineties with extreme racing machines in offshore races like *Rimini-Corfù-Rimini* (1000 miles along Adriatic and Ionian Seas), and often beating them.

ISABELLA - n.133, 1995

Figure 20: ISABELLA

"There is a measure difficult to make with fine shape, the shape I would always like to make. It is the 14 meters of length over all. It is too big for being maneuvered without effort by a single man, too big for maintaining it alone, basically with a "twelve" or "thirteen meters" you do the same things with less effort. And it is too small for having a paid hand, for carrying two couples and a paid hand on a cruise. In my design archive the fourteen meters is the most rare boat.

It's a pity, because it's a nice measurement.You already have a big boat, you can put a small trunk, and it sails already like a small ship. She is a small ship, where the thirteen meters is not."

ISABELLA is light, but with no exaggeration. She can be maneuvered without much effort, is balanced, fine, elegant. She has a classic appearance with some overhang, and a vertical transom. The interior arrangement has two cabins and a toilet.

"The two mast boat must be narrower compared to one with a single mast. Some production ketches built in Italy during these years are ridiculous. The owner then complains because the mizzen doesn't carry, so he never uses it. Obviously, the beamy boat has to be born with a single mast, small mainsail and big genoa. If I give her a different rig, she will search alone her natural rig, leaving out what is wrong. This does not happen with ISABELLA"

Length over all	m.	14.00	(45.9 ft)
Length at waterline	m.	11.45	(37.6 ft)
Beam max.	m.	3.45	(11.3 ft)
Draft	m.	2.20	(7.22 ft)
Displacement	tonn.	9.00	(19840 lbs)
Ballast	tonn.	4.00	(8820 lbs)

ISABELLA was built by *Alto Adriatico* yard, the yard that along with *Carlini's* yard built most of the wooden yachts designed by Sciarrelli in recent years.

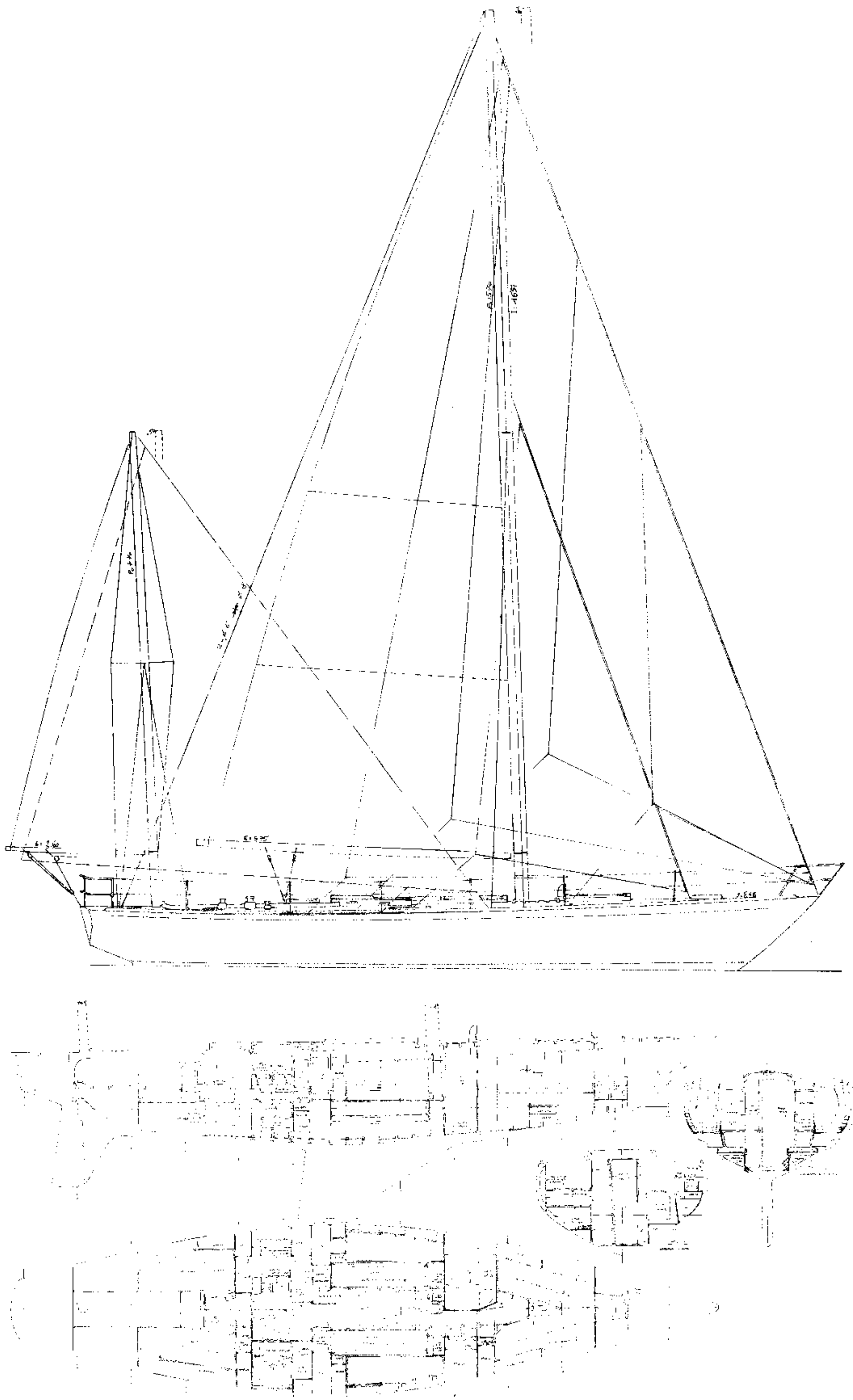


Figure 19: ISABELLA

Figure 21: S.NICOLÒ

Barche

S.NICOLÒ - n.90, 1981

S.NICOLÒ is probably the most perfect realization among a series of small day-sailers designed by Sciarrelli during 40 years. It is a seven meters (23 feet) boat overall, which summarizes in it the essence of "boat", like it can be imagined by a child. Something that has no age, a similar shape can be found in a Canaletto's view of Venice's Canal Grande in XVIIIth century (Giovanni Antonio Canale, called *Canaletto* (1697-1768), known for his view paintings), like in the *passere*, small boats used for fishing and racing built during the last century in many Dalmatian Islands. The sections are gentle, with full bow with long bowsprit, a simple gaff rig, transom with external rudder. A small cabin trunk, very simple interiors with a couple of berths and a small kitchen. Large cockpit.

The design is peculiar in that it is drawn with the old technique, the lines are inside planking, and the base line is parallel to the keel, not the waterline. This results in having horizontal planes that are not the common waterlines. Only a very experienced eye, accustomed in studying designs drawn with such technique, can draw such a boat. Sciarrelli did this, for a traditional yard in Trieste who built S.NICOLÒ with traditional techniques longitudinal planking on alternated steam bent and sawed frames. The small boat was so nice that some two more customers decided to build sister-ships of this very special day-sailer. A fourth one is presently under construction.

Length over all	m.	7.00	(23.0 ft)
Length at waterline	m.	6.28	(20.6 ft)
Beam max.	m.	2.28	(7.48 ft)
Draft	m.	0.86	(2.82 ft)
Displacement	tonn.	2.10	(4630 lbs)
Ballast	tonn.	0.75	(1650 lbs)

ITALIA - n.84, 1980

Figure 23: Italia

ITALIA was born starting from a phrase present in Sciarrelli's book at chapter XVI: *"for me, DYARCHY is the most beautiful cruising boat floating still today"*. Well, the customer asked for a boat of that type, but nicer than DYARCHY[1].

She was built in Trieste by Craglietto yard, launched in November 1981.

She is a traditional boat with high level finishing. A type of boat that you can think of in any period, because the external rudder takes off the "yacht" character that ages a design . Without peculiar features typical of some periods, such as the plumb or clipper bow, without any decorations, but also without any tracks on deck, Marconi rig but with wooden mast, tiller helm. Topsides and superstructures in varnished wood, mahogany and teak. A "zeitlose" shape.

"When moored at the yacht club she is the destination of countless people trips, like a monument. She always has a small host of admirers in front of her, commenting about the boat. Anyone finds that she is marvelous, but in some detail she could have been different. I tried to imagine this boat praised by everybody leaving out the condemned details and nothing remained, the boat disappeared.

Exposing to the public judgement a too beautiful yacht is an impudent challenge, you must then nod your head and bear silently the intolerance of people going around with rubber boats."

Length over all	m.	13.50	(44.3 ft)
Length at waterline	m.	11.00	(36.1 ft)
Beam max.	m.	3.60	(11.8 ft)
Draft	m.	1.95	(6.40 ft)
Displacement	tonn.	14.75	(32510 lbs)
Ballast	tonn.	6.50	(14330 lbs)

ITALIA is, in all respects, more gracious and "mediterranean" compared to her base boat, DYARCHY. She is lighter, with a lower freeboard, and a less rugged overall look. Sailing her, she behaves sweetly, and is fast, leaving almost no wake behind her. She is presently moored at San Giorgio Island, in front of San Marco Square, in Venice.

GRANDE ZOT - n.93, 1982

Figure 25: GRANDE ZOT

"[...] I design a lot of old type yachts because I'm learned and I have a good memory. Today there are some requests that once were already answered. Today nobody

[1]DYARCHY is the famous 45 foot cruising gaff cutter designed by Laurent Giles in 1936.

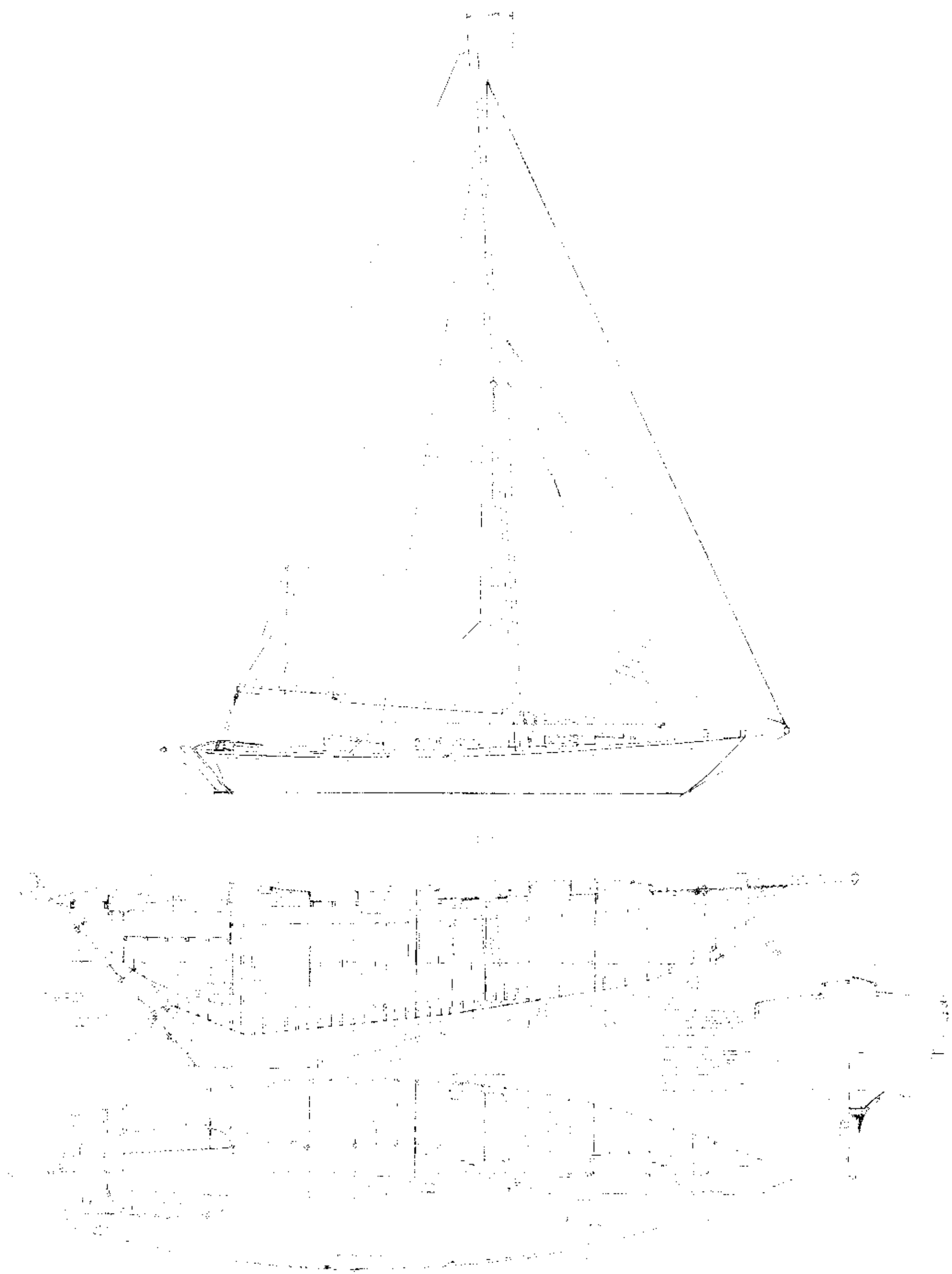


Figure 22: ITALIA

has memory, nobody remembers. One starts each time from zero like sailing wasn't an experiment we have been doing for a long time. When a customer wants a fast yacht, with minimal effort, low masts, with a certain type of furnishing and a certain weight, among the set of people who already tried to make such boat there are a lot of old answers and no modern ones. It is not modern having a boat with a small crew. It is not modern having a boat with bulwarks, where it is nice to spend some time. It is modern to sit on an uncomfortable boat, very light, with a lot of sail, dangerous, with winches for maneuvering. If one asks to not to have winches, having sails demanding small efforts, old designers found an answer, modern ones no. I want to say: I choose the old style not for the style, but for the technical side that is requested. If one wants a laborious boat, needing to change a lot of sails, sailing often with the spinnaker - because he likes it very much - modern designers found a better answer. If one wants

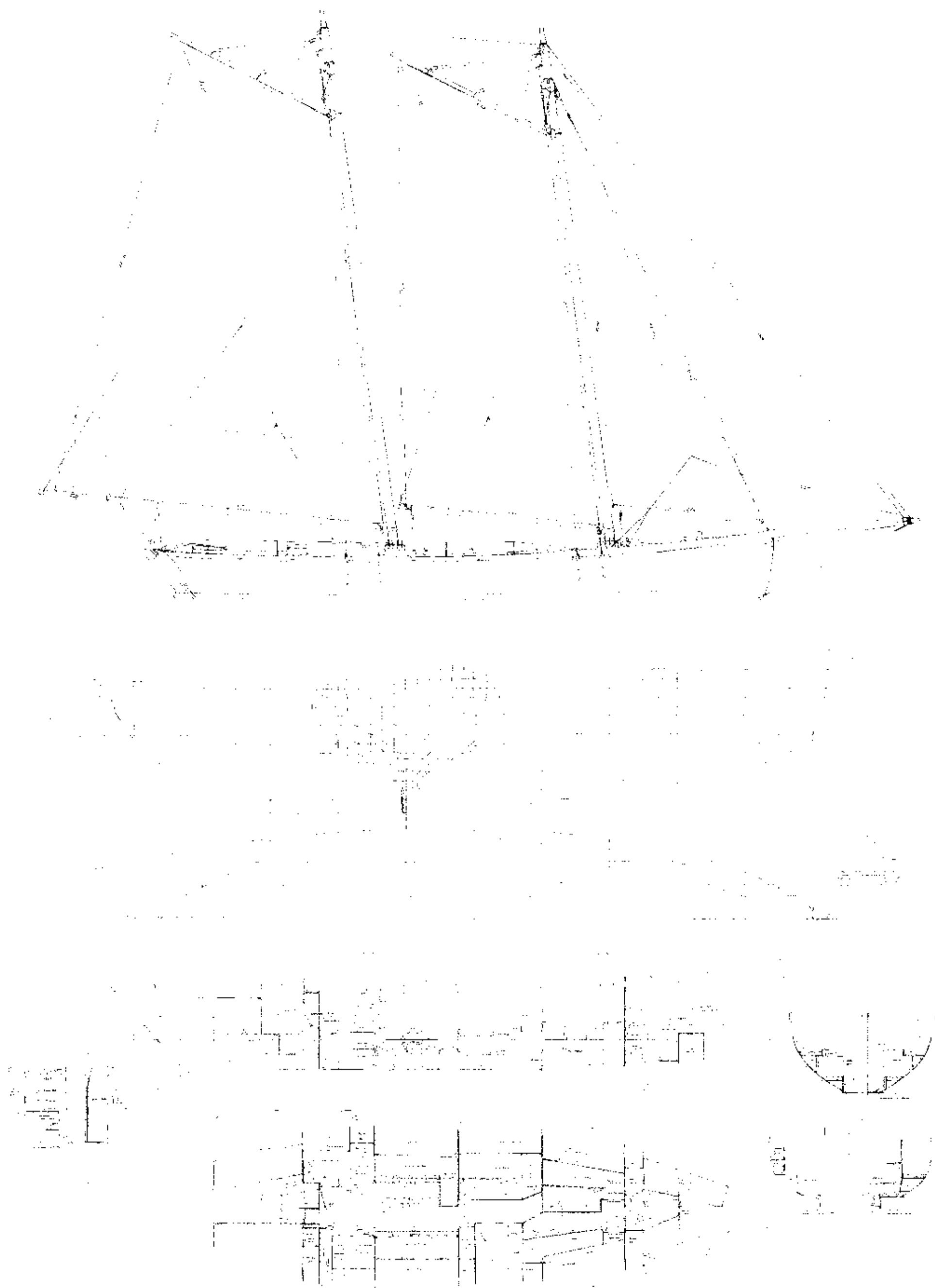


Figure 24: GRANDE ZOT

a boat where you never change sails because she is fine and fast already with little sail area, there is little choice: modern boats don't do it"(Il Gazzettino 1985) GRANDE ZOT was conceived as a poor boat that had to repay herself with charter activity. Therefore built of steel. Hull, deck, trunk. Everything heavy. Modern hull shapes are thought for modern weights and if for saving money you make them heavy - you don't do modern boats, even if putting a modern bow and fin keel and separated rudder. A boat is its hull, that is its displacement, so the immersed volume, and with same length and different weights you must have different hulls.

"A steel boat doesn't weigh like a cold moulded or like a GRP boat. She weighs, look what a coincidence, like old boats built with doubled-sawed frames, inside and outside planking and pitch pine deck. The weights of today's steel. For this reason making an iron boat today with a modern shape like light boats above the waterline but deformed below for giving room for the greater volume they have is very misleading, compared to doing it with the shape

always used with that weight, the ancient weight. [...] If one chooses the traditional look for aesthetics and then makes the boat with a rich tone the result that obtains for me has only one definition. Disneyland."(Sciarrelli 1969)

Length over all	m.	16.00	(52.5 ft)
Length at waterline	m.	14.55	(47.7 ft)
Beam max.	m.	4.05	(13.3 ft)
Draft	m.	1.70	(5.58 ft)
Displacement	tonn.	19.00	(41880 lbs)
Ballast	tonn.	6.50	(14330 lbs)

The line plan shows a boat with high prismatic, the volume is carried all along the extremities, thus obtaining a long run with slightly cambered buttocks. You recognize, in these lines and in all the character of the boat, a strong influence of the fast American schooners of the early XIXth century. Even decades before there were nice examples of "light" (for those times) and quick boats, above all Sciarrelli admired the hull lines of ST.ANN, a dispatch schooner built in 1736 and described by Chapelle in his *The Search for Speed Under Sail*.

The long shallow keel gives enough grip for discrete upwind sailing, while performing at best in reaching and running conditions. The rig is that of an extremely simple gaff schooner, with low raked masts almost without shrouds.

GRANDE ZOT has five sister-ships, currently sailing and doing charter in many different seas, from the Caribbean to Mediterranean. Eric Tabarly (a record setting distance sailor often called the father of French yachting, lost at sea in 1998), when he saw this fascinating schooner, wanted to rent it for a holiday in the Caribbean. *"You have a very good and awesome boat"* he told the skipper/owner Giancarlo Toso.

VALENTINA - n.96, 1982

Figure 27: VALENTINA

"[...] The theme was an elegant yacht for summer cruises of the owner with his family.

After a life of yachting. Regattas with 6m S.I., RORC and IOR boats. The style of the new boat had to be traditional, with bulwarks, skylights on deck, easy to maneuver, fast with small sails. A boat not too big, but that had to give the feeling of a ship."

VALENTINA is very elegant. A Marconi ketch, with bowsprit and very raked masts. This is a characteristic of well balanced yachts that don't put effort on the helm. Conversely, the more a hull is unbalanced, the more it is correct to use a big genoa on a vertical mast, for counteracting the hardness on the helm when it starts heeling, or the impossibility to steer under a gust. We know that it depends on the hull shape, from a fine bow with wide stern, typical of modern production boats. Modern boats have a vertical mast because it is correct for their hull shapes.

"On the contrary, a hull that when heeling remains balanced, sails better with small jibs and a bigger mainsail with long boom. She will be a boat where all the maneuver on sails will be reefing the mainsail. The jibs will always be the same two. It would suffice to lower one with strong wind, and with two mast then it would suffice to lower one of the two mainsails. Four sails in all." (Sciarrelli 1969)

Length over all	m.	14.80	(48.6 ft)
Length at waterline	m.	12.60	(41.3 ft)
Beam max.	m.	3.60	(11.8 ft)
Draft	m.	1.65	(5.41 ft)
Displacement	tonn.	14.50	(31960 lbs)
Ballast	tonn.	5.50	(12120 lbs)

VALENTINA is a good example of the way Sciarrelli thought of the boat as a single unit composed of many items, which interact among each other. Specifically, comparing her with ITALIA, you'll appreciate the differences induced by the ketch rig choice, within the same overall traditional layout. VALENTINA is narrower, lighter, with less ballast and shallow keel compared to ITALIA. All these represent "ketch boat" features, compared to the "cutter-boat" features.

HILDE - n.131, 1994

"Boats belonging to ANFITRITE's family are beautiful, one better than the other. But may be this is wrong, if one is better than the previous one, this means that there was something to improve. Even this is not sure, because each one taken alone is perfect. But each one is of such a type that if you remake it, you'll change something, you cannot do it as before.

So no one can be the most beautiful.

Those belonging to AGLAJA's family are all the same. There is some difference, but they are the same. Thirty years between AGLAJA and HILDE and they are the same. In the shape, they could not be made more equal. HILDE is AGLAJA with more spaced sections.

Maybe, for trying another definition, this type is in fash-

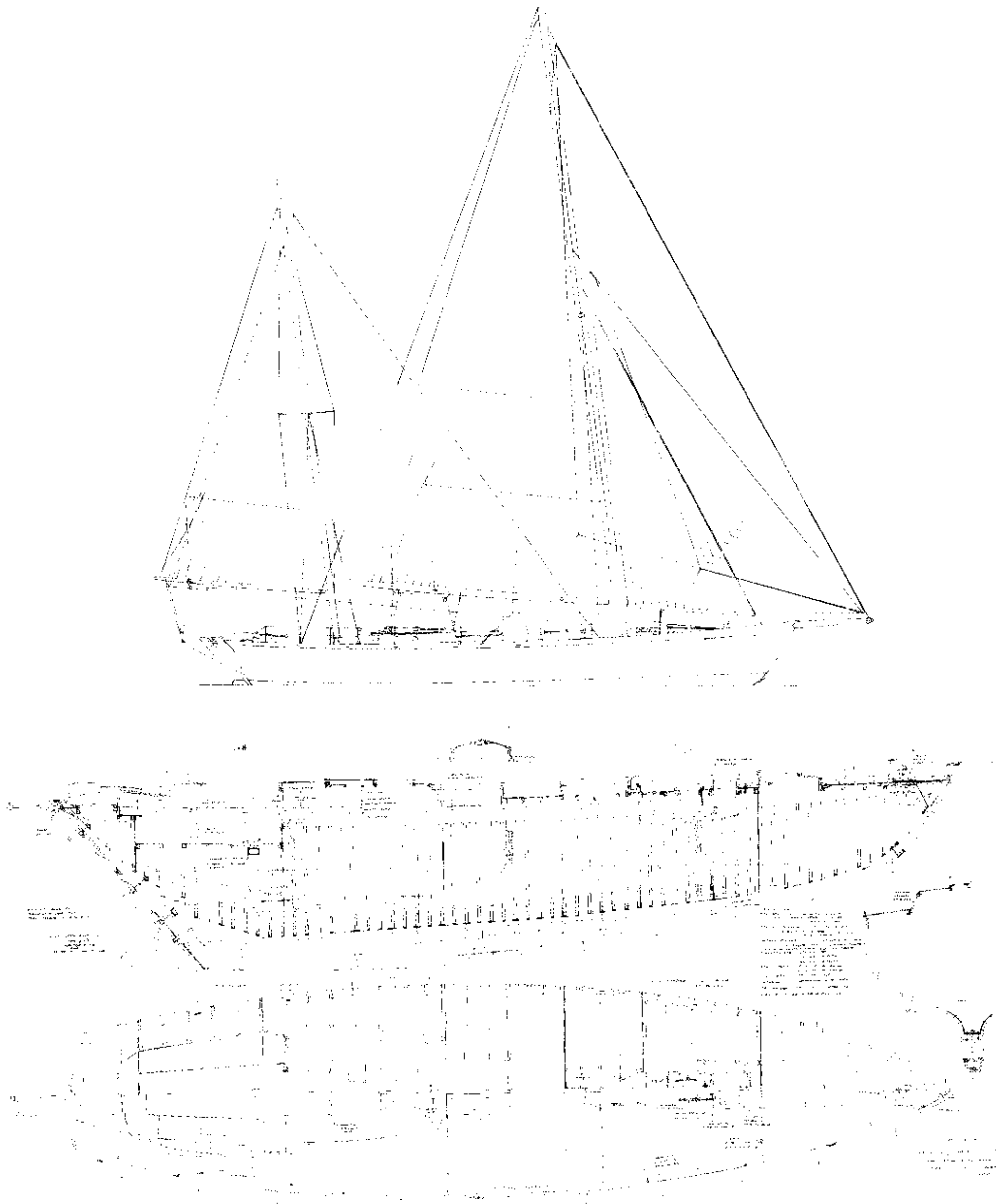


Figure 26: VALENTINA

ion because she is never in fashion. Maybe she is in fashion, is always awesome, because she doesn't give the idea of a yacht, a pleasure boat or a racer. She gives more the idea of "professional", a vague idea of a boat with which one works. [...]

I designed the same boat for thirty years, spacing it out with continued variations of the other type. Variations which will never end for one type. And that I will keep alternating it with replicas of this other type.

Some sailed around the world, some other won races. All of them satisfied the owner and the eyes of those who look at them."

HILDE is the *summa* of these thirty years of tests. The theme was that of a small boat for short tours, a high quality *day-sailer*, for a windy and open sea like Sardinia, base harbour Porto Rotondo. The same use of the 8 m S.I., ex-racer, between the two world wars, that gentlemen utilized only for short sails during summer. A sailing version of the *Riva* roundabout after the second World War.

"The minimum measure, 11 meters, has been chosen for having standing headroom without a big cabin trunk.

Inside there is a locker, a small kitchen, two sofas, a chemical WC separated by a curtain, and the possibility to put two pipe berths. No bulkheads. The cockpit is not self-emptying, very big. One sits very low and from the cockpit washboard only the head comes out.

Figure 28: Hilde

The Helmsman seat is transverse, like metric boats, the deck is painted, which gives a very light look, sporty and luxurious. Yes, because rich boats have a teak deck, while fishermen boats have a painted deck. But the eight meters S.I. of the kings had a painted deck, like those of fishermen. The extremes touch." (Sciarrelli 1969)

Length over all	m.	11.00	(36.1 ft)
Length at waterline	m.	8.70	(28.5 ft)
Beam max.	m.	2.95	(9.68 ft)
Draft	m.	1.60	(5.25 ft)
Displacement	tonn.	6.50	(14330 lbs)
Ballast	tonn.	3.20	(7050 lbs)

CONCLUDING REMARKS

What we have shown and described here, often with his words, is a small part of the production of Carlo Sciarrelli, a distinct yacht designer, and a very special person. We believe that the timeless, truly classic spirit of these yachts can be well understood when looking at the presented designs and pictures. Sciarrelli's boats, we think, are modern and classic at the same time, and represent, still today, one of the best choices for the sailor who loves offshore sailing, with a graceful, safe, and awesome boat.

ACKNOWLEDGEMENTS

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Photographic credits: Sciarrelli's archive, Bert Richner (fig.8), Gianfranco Gulli (fig.17), Franco Pace (fig.20)

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Davide Battistin has a PhD in Naval Architecture an Marine Engineering, and is a consultant in the field of Velocity Prediction Programs. He worked as researcher at the Italian Ship Model Basin (Roma), in the domain of computational fluid dynamics. He is author or co-author of 30 scientific papers. As a sailor, he sails since he was child, on many different boats: dinghies, racing yachts, blue water cruisers. He sailed more than 20000 miles on Sciarrelli's yachts.

Federico Lenardon has been since many years a collaborator of Carlo Sciarrelli. He designed two classic day sailers, built by Cantiere Alto Adriatico (www.cantierealtoadriatico.it), where he works since 10 years as carpenter and designer. Beside this, he has a long sailing experience, with both racing and cruising yachts, either classic or modern.

Figure 30: Federico Lenardon (left) and Davide Battistin (right)

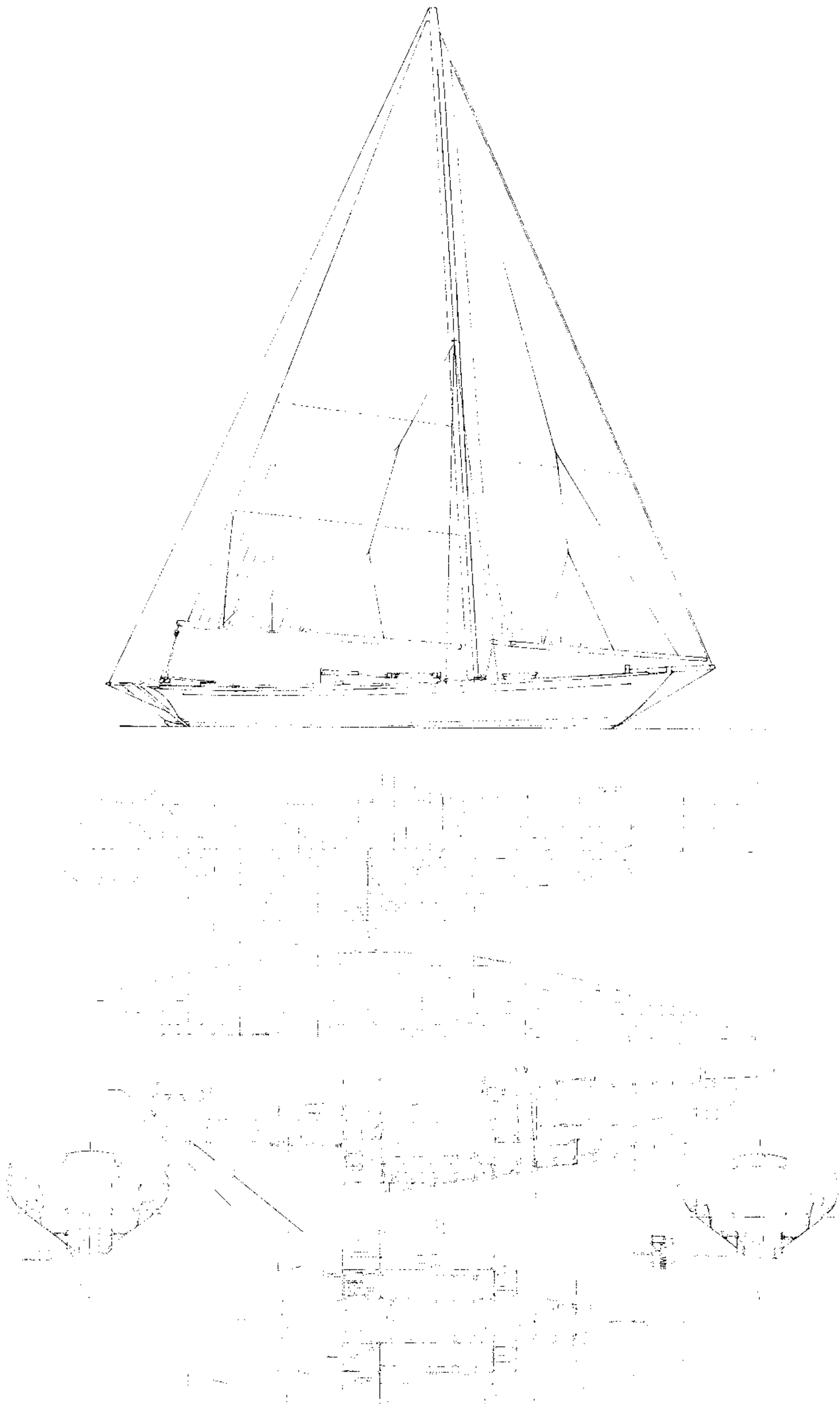


Figure 29: HILDE

S/V SARAH
A Love Affair

Margo Geer
Owner – Photos by author unless noted

INTRODUCTION

S/V SARAH is a Concordia yawl, Hull #27. She was purchased in St. Augustine, Florida, at a sheriff's auction in July of 2000. At the time of the purchase, our intent was to make the vessel seaworthy and resell her. Within a matter of days, we decided to keep her and subsequently committed ourselves to doing right by the vessel, which, over the course of 7 ½ years, came to entail a complete rebuild including floors, frames, stern knee, deadwood, keel bolts, refastening the deck and hull below the waterline, and new: engine, electrical, plumbing, standing and running riggings, and sails.

HISTORY

Llewellyn Howland established Concordia Company in 1926. He named the company after a famous Howland family whaling vessel. In 1932 Llewellyn transferred the company to his son, Waldo, and Marblehead racing celebrity, C. Raymond Hunt. They redrew the terms of the corporation to more closely fit with the boat business they had created and operated the company as a successful boat brokerage through the 1930s.

In 1938 the company moved from Boston to Fairhaven, Massachusetts. This brought Waldo closer to Buzzards Bay, and it also brought tremendous destruction in the Great Hurricane of '38, which destroyed the Howland family's own ESCAPE, a Norwegian pilot boat designed by Colin Archer and built in 1890.

Llewellyn hired Concordia Company to design and build a boat to replace ESCAPE. He wanted a daysailer that could race and cruise in the choppy seas and heavy afternoon breezes of Buzzards Bay. In his biography, Llewellyn Howland is quoted as stating that "the new forty-foot boat should sail on her bottom, not on her side, and approach the speed of her length under the widest range of weather conditions likely to be met with off or along shore on our Atlantic seaboard. All other details were subordinate to these cardinal qualifications." What began as design number fourteen became the classic Concordia yawl.

Designer Ray Hunt drew the lines for the new boat, which Llewellyn later described as "a beautiful set of lines, showing a profile with moderate ends, a lovely sheer, and moderate freeboard."

Between 1938 and 1966 the Concordia Company commissioned 103 boats. Hull #1 – JAVA was built for Llewellyn Howland by Casey in 1938; Hull #2 - JOBISKA was built by Lawley in 1939; Hulls # 3 & 4 – HALCYON AND ACTAEA by Casey; and hulls # 5-103 by Abeking & Rasmussen (hereinafter A&R). According to *The Concordia Years,* Volume II of Waldo Howland's biography, the association with A&R began in 1948 when Drayton Cochran entered into an agreement for A&R to build LITTLE VIGILANT, a cruising boat designed by Walter McInnis.

When he was in Germany commissioning LITTLE VIGILANT, Drayton Cochran submitted Concordia yawl plans to A&R. They thought well of the plans and returned an initial building quotation of $7,500.

The first A&R built Concordia yawl was delivered to Drayton Cochran in New York during the fall of 1950. Granted permission by Cochran, and at his price, Concordia sold the first A&R Concordia yawl to Edward Cabot of Westerly, Rhode Island. Cabot named her SUVA. Drayton Cochran then ordered two more

Concordias from A&R, one of which he kept for himself. Similar transactions followed with Drayton Cochran doing the financing and Concordia Company doing the selling.

In 1951 Waldo Howland traveled to Germany to tour the A&R yard, and Waldo stated that he felt at home from the start as Henry Rasmussen reminisced about his early contacts in the United States, especially Nathanael Herreshoff, whose yard and boatbuilding program he had seen, studied, and admired.

During World War II, A&R hid many of their big logs in nearby shallows to save them from the war effort. It has been said that much of the iron for the ballast keels is melted down war munitions, but, while possible, I have not been able to verify that comment.

Logs were taken from storage as needed, sawed into full-length, live edge planks 3”-4” thick, then each plank was branded with an individual reference number, and the planks were stacked and retained as a unit. (Figure 1)

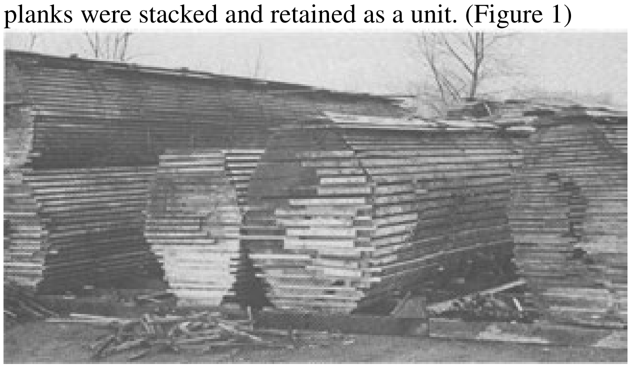


Figure 1 - Whole trees milled and restacked at A&R.
©*A Life in Boats – The Concordia Years*

When an order for a Concordia was received, the lumber files were consulted and the required planks were taken from storage, resawed, planed, and placed in an air-conditioned chamber to ensure they contained exactly 12 1/2 % moisture.

The A&R planking style differed in several ways from the traditional US methods and not just in millimeters when the plans were redrawn to metric units. There is no garboard plank, but rather the planking commenced in a diagonal direction over the deadwood from sternpost to keel, where each plank died out to a point and each successive plank rapidly became longer and closer to level as the strakes climbed up the frames. Building this way required less shaping of the planks, which was an advantage because a straight plank tends to be stronger with straight grain running the entire length. Straight planks also lay up easily and create less waste material.

Prior to planking, the frame units (each consisting of a pair of frames, a floor timber, and a deck beam) was attached to the backbone. This was a very efficient way to build boats, but makes it virtually impossible to remove an individual frame or deck beam. (Figure 2)

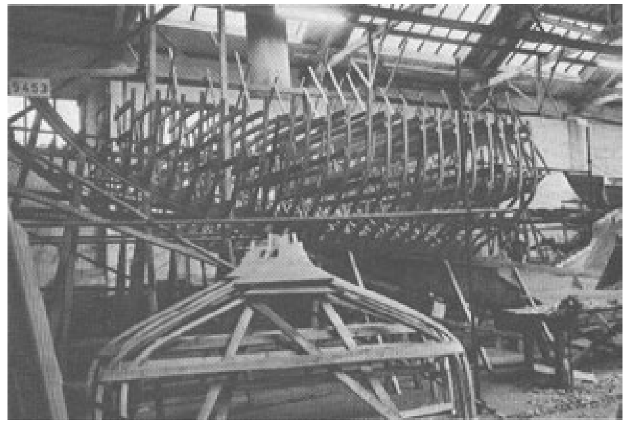


Figure 2 - Boat assembly at A&R.
©*A Life in Boats – The Concordia Years*

Concordias were not built with the traditional caulking bevel, but had a ¼” groove that ran fore and aft in the center of the top and bottom of each plank edge. The groove depressed the plank edge enough to run a single strand of cotton wicking that was placed in the void created by the facing groove when one plank was set against another. Two crews of two men each started on each side of the hull. One crew worked from the keel up, the other from the waterline down. This illustration shows the shutter plank where the two crews met. (Figure 3)

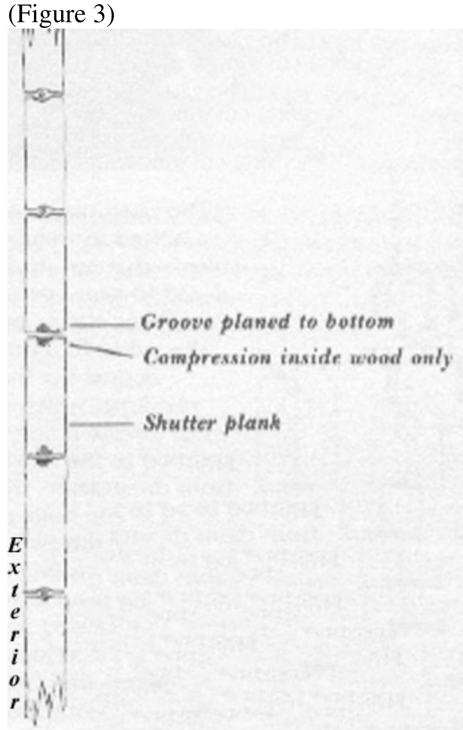


Figure 3 - A&R planking technique. ©*A Life in Boats – The Concordia Years*

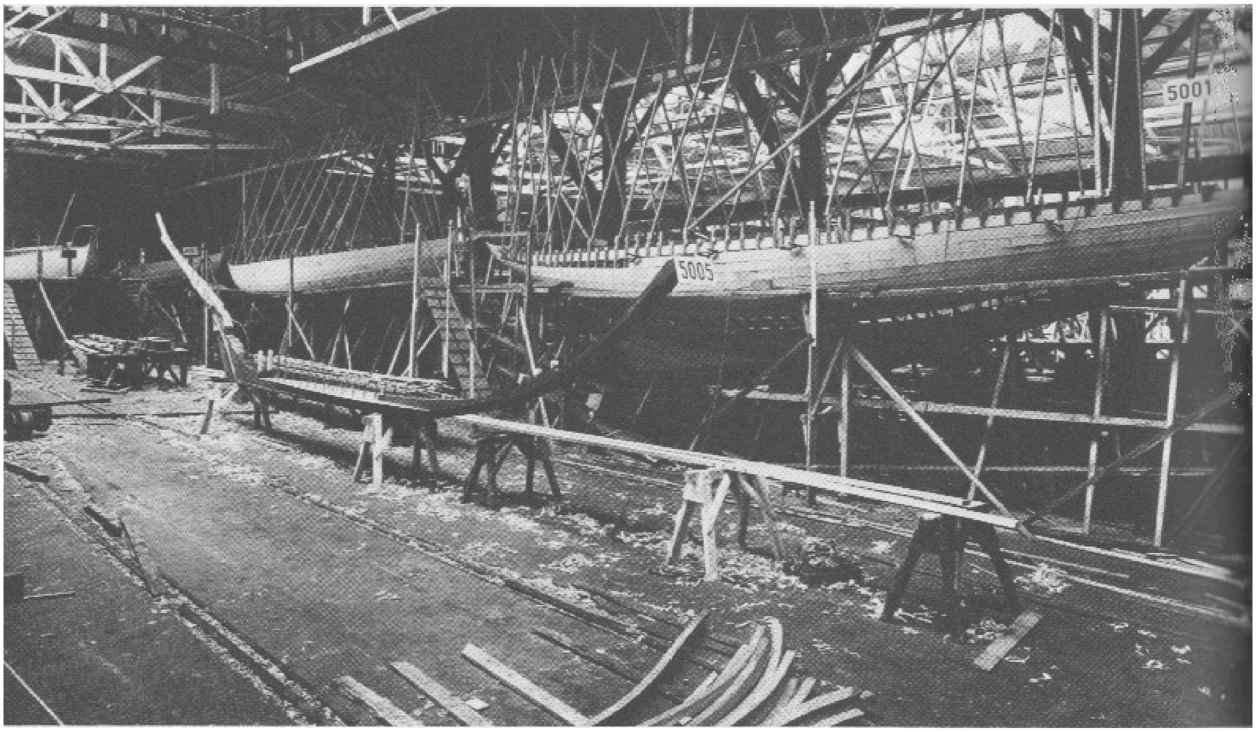


Figure 4 - Five Concordias under construction at A&R. ©*Concordia Yawls – The First Fifty Years*

Figure 5 - Three Concordias being readied for shipment to the United States. © *Concordia Yawls – The First Fifty Years*

Another Concordia difference that illustrates the evolution of boatbuilding ideas in this time frame is the construction and joinery of the cabin house. Traditionally there was a heavy structural fore-and-aft carlin into which the ends of the deck beams were either dovetailed or halved. Herreshoff boats were through-bolted to the inboard ends of the deck beams with the cabin house itself providing the fore and aft stiffness.

The A&R cabin house sat on a plank-like member 4"-5" wide so its upper surface came flush with the tops of the beams. The cabin rested directly on this sill piece where it was securely fastened.

Construction is 1-1/16" African mahogany planking on oak frames. The backbone, deadwood, and floors are white oak. Frames are steam-bent oak, 1-3/8" x 1-5/8" on 9” centers. Concordias are bronze fastened and have either canvas or laid teak decks. Figure 4 shows five Concordias under construction at Abeking and Rasmussen in 1955. In the foreground (Builder #5005) is SARAH’s backbone and keelson.

After completion in Lemwerder, the boats were towed up the Weser River to Bremen and loaded for shipping to America via the Holland-American or United States lines. (Figure 5)

Boston was the preferred offloading port. From there they were towed to Padanaram by a 39 foot Nova Scotia lobster boat named FETCHER, which was adapted for the purpose.

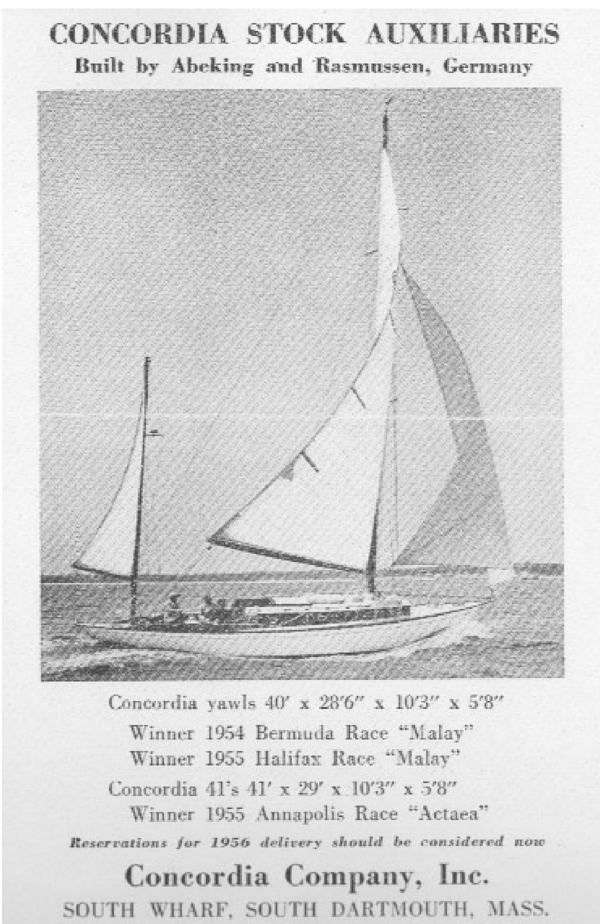


Figure 6 - 1950s Concordia Brochure.

The Concordia Standard Thirty-nine yawl is 39’10” on deck; lwl 28'6"; beam 10’3”; Draft 5'8"; displacement 18,000 lbs; ballast (iron keel) 7700 lbs; and had an original sail area of 650 sq. ft . While many Concordias were adapted for various tastes and requests of the owners, the most significant change occurred in 1953, when Ray Hunt designed a 41 foot version for Henry Sears.

The 41s had an increased waterline length, beam and freeboard and obtained a lower CCA rating than the 39. The 41s were successful in various arenas such as Annapolis-Newport and Cowes, but the 39 continued to dominate in offshore events.

The sail plan on the 41 called for a single-spreader 7/8ths rig and a small bow sprit. There was also a sloop option and some boats, such as SARAH, were designed to be interchangeable.

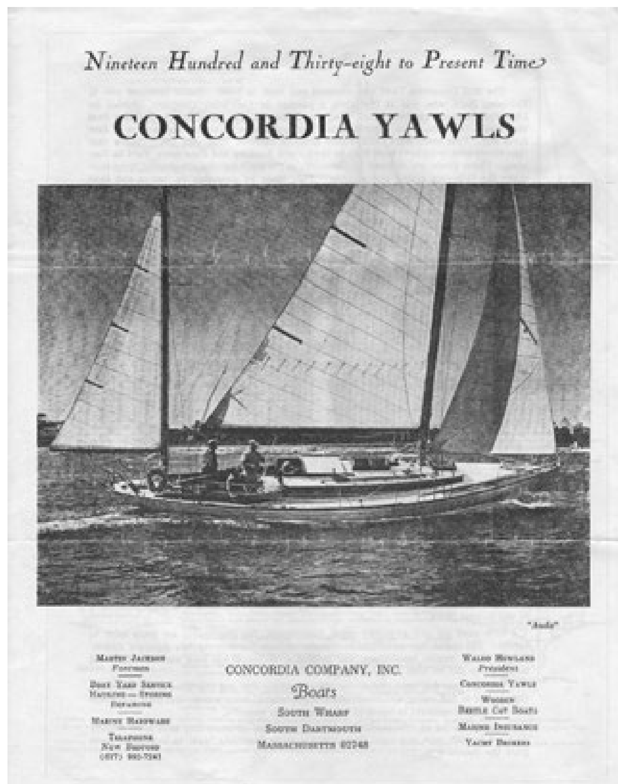


Figure 7 - 1960s Concordia Brochure.

In approximately 1954 it became clear that the hard bilges in the Concordias were causing an unacceptable number of cracked frames on even recent A&R-built boats. The original frame design used steam-bent frames, and the early boats developed serious fractures at the outside turn of the bilge. Concordia Company decided to make good on what was, really, a manufacturing defect. They removed the interiors and replaced the affected single-piece oak frames with laminated oak frames and, in some instances, added laminated sister frames.

Between 1938 and 1966, 103 Concordias were built. Seventy-eight of the boats were 39s and twenty-five were 41s. (Figure 8) All 103 are believed to be in existence today. We are in the process of documenting the present condition of all 103 boats for the Concordia 70th anniversary.

Concordia Yawls and Sloops

Boat #	Year Built	Length	Current Name	Boat #	Year Built	Length	Current Name
1	1938	39	*Java*	53	1957	41	*Dolce*
2	1939	39	*Malay*	54	1957	41	*Horizon*
3	1946	39	*Halcyon*	55	1957	39	*Kiva*
4	1947	39	*Tempo*	56	1957	39	*Whisper*
5	1950	39	*Duende*	57	1958	39	*Javelin*
6	1951	39	*Rowdy*	58	1958	39	*Off Call*
7	1951	39	*Aureole*	59	1958	39	*Snow Bird*
8	1951	39	*Papajecco*	60	1958	41	*Principia*
9	1951	39	*Whisper*	61	1958	39	*Tam O'Shanter*
10	1952	39	*Praxilla*	62	1958	39	*Thistledown*
11	1952	39	*Winnie of Bourne*	63	1958	41	*Sonnet*
12	1952	39	*Absinthe*	64	1958	39	*Live Yankee*
13	1952	39	*Phalarope*	65	1958	39	*Golondrina*
14	1953	39	*Saxon*	66	1959	39	*Eclipse*
15	1953	39	*Lotus*	67	1959	39	*Crocodile*
16	1953	39	*Maggie Dunn*	68	1959	39	*Desperado*
17	1953	41	*Actaea*	69	1959	39	*Houri*
18	1954	39	*Spice*	70	1959	41	*Irian*
19	1954	41	*Otter*	71	1959	41	*Polaris*
20	1954	39	*Fleetwood*	72	1959	41	*Tecumseh*
21	1954	39	*Streamer*	73	1959	39	*Tosca*
22	1954	39	*Hero*	74	1959	39	*Wizard*
23	1954	39	*Starlight*	75	1959	39	*Portunus*
24	1955	39	*Niam*	76	1960	39	*Sumatra*
25	1955	39	*Wild Swan*	77	1960	39	*Malay*
26	1955	39	*Mary Ann*	78	1960	39	*Matinicus*
27	1955	41	*Sarah*	79	1960	39	*Westray*
28	1955	39	*Safari*	80	1960	39	*Goldeneye*
29	1955	41	*Feather*	81	1960	39	*Envolee*
30	1955	39	*Harrier*	82	1960	41	*Coriolis*
31	1955	39	*Owl*	83	1961	39	*Christie*
32	1955	39	*Mirage*	84	1961	39	*Snow Falcon*
33	1955	39	*Weatherly*	85	1961	41	*Arapaho*
34	1955	39	*Mandala*	86	1961	39	*Dame of Sark*
35	1955	39	*Memory*	87	1961	39	*Allure*
36	1956	41	*Magic*	88	1962	41	*Luna*
37	1956	41	*Yankee*	89	1962	39	*Woodwind*
38	1956	41	*Nefertiti*	90	1962	39	*Fabrile*
39	1956	39	*Donegal*	91	1962	39	*Snowy Owl*
40	1956	39	*Skye*	92	1962	41	*Savu*
41	1956	39	*Sisyphus*	93	1963	41	*Eden*
42	1956	39	*Margaret*	94	1963	41	*Katrina*
43	1956	39	*Raka*	95	1963	41	*Diablo*
44	1956	39	*Lacerta*	96	1964	41	*Whimbrel*
45	1956	39	*Loon*	97	1964	39	*Summer Wind*
46	1956	39	*Kodama*	98	1964	41	*Madrigal*
47	1957	39	*Ariadne*	99	1965	39	*Kee-Nee-Noh*
48	1957	39	*Harbinger*	100	1965	39	*Captiva*
49	1957	39	*Moonfleet*	101	1965	41	*Sea Hawk*
50	1957	39	*Carol Lyn*	102	1966	39	*Abaco*
51	1957	30	*Vintage*	103	1966	39	*Irene*
52	1957	41	*Taliesin*				

Figure 8 - Concordia Yawls and Sloops. Compiled by author.

HULL #27

On September 23, 1954, Waldo Howland placed the order for SARAH (ex. GAMECOCK II) via correspondence to Horst Lehnert. On October 8, 1954, the order was confirmed with a base price of $14,750.

ABEKING & RASMUSSEN
YACHT- UND BOOTSWERFT
LEMWERDER I. O.

Concordia Company, Inc.
c/o Mr. Waldo Howland
South Wharf
South Dartmouth / Mass.
U S A

Air-Mail

8th October, 1954 Fr/H

Re: New Concordia 41 for Mr. West
Construction 4999

Dear Mr. Howland,

We are very happy to hear about the new order given by Mr. West and we may inform you that the base price will be

$ 14.750,--

fob Bremen.

We noted that the performance will be similar to Mr. Coo[illegible] 41.

Yours sincerely,
ABEKING & RASMUSSEN
i.V. i.V.

Lehnert Ohlendorf

Figure 9. *Concordia Co.*

As with most of the Concordias ordered, correspondence was exchanged between Concordia and A&R noting various changes and adaptations requested by Concordia or the purchasing owner.

Hull #27's paperwork includes significant requests such as changes to the leading edge of the keel, cockpit and house. The boat was also upgraded to add 1-1/4" laid teak decks. She was ordered as a sloop with a 3 foot bowsprit, a direct drive Gray Marine engine, 1 x 19 stainless rigging, and Formica coverings in the galley.

Ten pages of typewritten specifications titled "Design No. 14-2 Modified for Weekes and West" dated November 1954 cover everything from the stem (Oak, sided and moulded [sic.] as shown on plans) to the rudder (Shaped as shown on new design and fitted with brass trailing edge).

Murcop bottom paint was specified and her topsides were Halifax gray. Toe rail and hand rails were varnished, but her spars were painted. The boot top was light blue, the canvas on the house top and companion way was specified "very light gray – almost white."

A three-page equipment list, hand-written by Fenwick Williams, (Figure 10) contains standard items such as winches and opening ports and Concordia items such as funnels for gasoline and kerosene, 1 hammer, and 1 marlin spike. A later piece of correspondence from Williams to Waldo Howland notes the longhand equipment list should be checked carefully as it "probably consists almost entirely of errors."

Equipment List

	Furnished By	Installed By
1 marlin spike		
1 hammer		
1 key for deck plates		
3 shackle openers		
1 copper container for alcohol		
1 " " " kerosene		
1 funnel for gasoline		
1 " " kerosene		
1 kerosene anchor light		
1 ventilator in stern deck		
1 " 3" A. & R. type over toilet room		
2 round opening ports in forward end of house		
2 oval " " " house sides, 1 in toilet room, 1 opposite, A. & R. type		
6 oval fixed lights in house sides		
1 6½" dia. opening port in forward end of cockpit		
2 towing chocks aft		
2 top action winches on coaming pads	Owner	Concordia
1 " " winch for main sheet on coaming pad	"	"
1 No. 2 top action winch on mast for jib halyard	A. & R.	A. & R.
1 " " " " " mast for main hal.	"	"
1 boom crotch, offset, bevelled, and padded	"	"
1 bronze rod traveler for jib		

Figure 10. *Concordia Co.*

The Concordia – A&R relationship carried on through various bits of correspondence, and although building standard boats from a set of templates, A&R seemed amenable to constant changes.

ABEKING & RASMUSSEN
YACHT- UND BOOTSWERFT
LEMWERDER I. O.

Lemwerder, November 24, 1954

Concordia Company, Inc.
Attention: Mr. Waldo Howland
South Wharf
South Dartmouth/Mass.-USA

Subject: New Construction No. 5005 for Mr. West.
Your Letter of November 4.

Dear Sir:

We acknowledge with thanks your kind above letter and wish to inform you that the changes of shaft line, of shape of rudder and of size of aperture can be still considered.

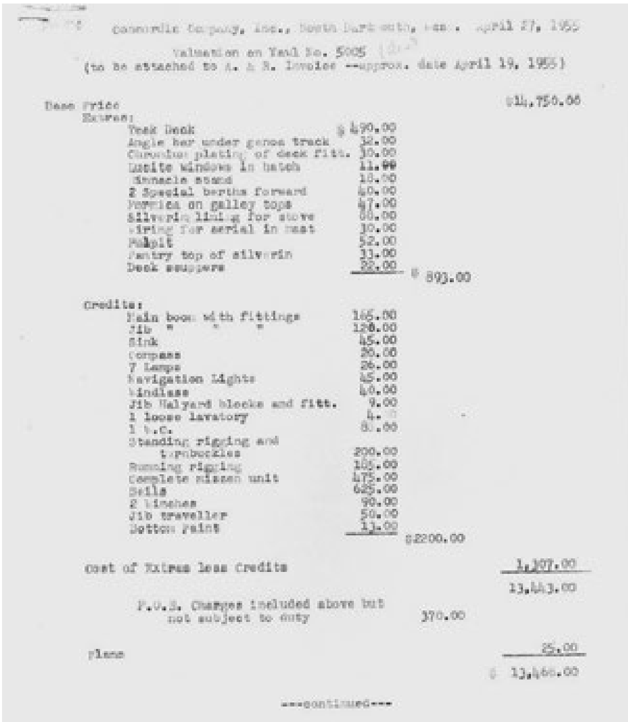
We remain

Yours very truly,
ABEKING & RASMUSSEN
i.V.

Lehnert

Figure 11. *Concordia Co.*

Although Messrs. Weekes and West upgraded to teak decks at a cost of $490 and various other extras such as an $18 binnacle stand and $47 for the Formica in the galley, credits from A&R more than offset the upgrades and the boat came in under budget at $13,468.00.



Concordia Company, Inc., South Dartmouth, Mass. April 27, 1955

Valuation on Yawl No. 5005
(to be attached to A. & R. Invoice --approx. date April 19, 1955)

Base Price $14,750.00

Extras:

Teak Deck	$ 490.00	
Angle bar under genoa track	32.00	
Chromium plating of deck fitt.	30.00	
Lucite windows in hatch	11.00	
Binnacle stand	18.00	
2 Special berths forward	40.00	
Formica on galley tops	47.00	
Silverin lining for stove	88.00	
Wiring for aerial in mast	30.00	
Pulpit	52.00	
Pantry top of silverin	33.00	
Deck scuppers	22.00	$ 893.00

Credits:

Main boom with fittings	165.00	
Jib " " "	128.00	
Sink	45.00	
Compass	20.00	
7 Lamps	26.00	
Navigation Lights	45.00	
Windlass	40.00	
Jib Halyard blocks and fitt.	9.00	
1 loose lavatory	4.[illegible]	
1 W.C.	80.00	
Standing rigging and turnbuckles	200.00	
Running rigging	165.00	
Complete mizzen unit	475.00	
Sails	625.00	
2 Winches	90.00	
Jib traveller	50.00	
Bottom Paint	13.00	$2200.00

Cost of Extras less Credits 1,307.00

13,443.00

F.O.B. Charges included above but not subject to duty 370.00

Plans 25.00

$ 13,468.00

---continued---

Figure 12. *Concordia Co.*

OUR STORY

September 1998

In September of 1998, my husband, Dave, and I had the opportunity to fly to Newport, Rhode Island, and sail aboard Bob Tiedemann's beautiful 12-meter GLEAM. We were surrounded by Newport's stunning collection of breathtaking boats, sailing in waters fit for the Gods, and rubbing elbows with folks who were happy to spend hours discussing the merits of varnish, and I decided that if there's a Heaven, then it must be something like this.

We were on our way back to the dock at the Museum of Yachting when we passed the most exquisite boat I had ever seen. Finished bright from her waterline to her masthead, RENAISSANCE (Concordia #88) was gorgeous!

Dave explained it was a Concordia and in the patient way that husbands do, went on to add that there was one in our marina. I couldn't imagine that I hadn't noticed something that beautiful, but he was right. When we returned to Florida, not only at our marina, but on the very next dock sat a Concordia. This boat didn't look much like RENAISSANCE though. Comparing the boat in our marina to the bright-finished RENAISSANCE was like looking at a photograph and then looking at its negative. The Concordia in our marina had been painted white from bow to transom. Mast, mizzen, cowl vent to cockpit coaming, she was white on white. She was also in an increasing state of neglect. We later moved our boat to a neighboring marina, and the sad white Concordia was out of sight and out of mind.

Figure 13 - Concordia # 88 – RENAISSANCE.

June 26, 2000

I had just come home from work and kicked off my shoes when Dave called me from his cell phone. He was down at our old marina and after a couple of idle minutes of chit chat, said words that changed our lives, "The Concordia's hauled out. She's going to be sold."

"Oh." was the best I could manage. I concentrated on taking deep breaths while he filled me in on what he'd heard about her and what he'd learned at the yard. Finally, in the calmest voice I could muster, I asked him, "Should I just come down?" "If you want." was all that he could manage.

Thankfully for the people on the roadways that evening, we live less than a mile from the marina. I pulled in next to Dave's car and found him standing beside the ladder.

"Have you been up yet? What does she look like?" I asked.

"I waited for you, so you could be first aboard." The most wonderful husband in the world answered.

Somewhere between the car and the ladder, I'd shed my high heels, so I gathered my skirt, and up the ladder I went. Scanning the deck, my first impression was that she looked good. It didn't seem like there were any obvious problems. I climbed over fenders and lines piled in the cockpit and crouched on what I know now to be the bridge deck. The hatch boards were out and the companion way cover was partially open. As I looked below, my breath caught in my throat and my eyes filled with tears. The cabin was in absolute disarray. Cabinet doors were hanging open or missing, cushions were scattered, sails were pulled out of their bags, and the coach roof was black with mildew.

We didn't talk about her too much right after that, but I wasn't too surprised when Dave announced a few days later that he'd arranged to take out a loan if we needed. After that, we alternated between not discussing her at all so we wouldn't get our hopes up and arguing over a name. (Dave won.) If one of us couldn't be found in the evening, our old marina was a sure bet.

Since Dave was making the financial arrangements, I spent my time researching the judgment that had been levied on her, speaking with attorneys, and trying to get a straight answer as to whether or not a purchaser at a public sale like this would be able to get clear title.

July 26, 2000

One month to the day was "SARAH Day" and the sale was at noon. I stopped by the boatyard early in the morning to talk to SARAH prior to the auction. As I stood there in the quiet marina, I laid my cheek against her hull and tears streamed down my face as I told her, "Five more hours Pretty, just five more hours. We're trying so hard. We won't know until noon, but we're going to do our best." I guess I somehow got a grip, and when she drew first blood (I picked off one too many barnacles), I went on to work.

Our sheriff's office had not handled a matter like this before, and somewhere in the archaic language of the judgment it said that the vessel was to be "sold to the highest and best bidder for cash" and nothing but nothing would convince the Powers-That-Be that they could accept a letter of credit or other terms. So not only did Dave arrange for a loan, he left the bank with cash. Not exactly a briefcase full either. Sadly, our life savings and the maximum value he could sign his name to fit in a couple of very small envelopes. He got to the marina early, and I arrived a few minutes before the auction was scheduled to start. As the hour of the auction approached, nerves were stretched to the breaking point as about a dozen people began to mill around the boat.

I was by the stern speaking with one of the deputies when Dave got my attention and said quietly, "I don't think I can do it, you're going to have to bid." I barely had time to absorb what he said when the deputy in charge called for all bidders to step forward. The deputies wisely claimed the shady area under the boat, and assembled us facing directly into the noon sun. I remember my main concern was not locking my knees and passing out as the deputy read every single word of the Judgment and Levy of Execution. The scuttlebutt around the yard had it that the bidding was going to start at a few hundred dollars, but from speaking with the attorney for the judgment holder, I knew that: a) the boat had been surveyed; and b) they were willing to accept the value given by the surveyor. With a nod from the attorney for the judgment holder, I opened the bidding with that amount and a gasp went through the crowd. The bidder standing immediately to my right was a local business owner, who I'd figured to be my competition. Remarkably, he stood silent. However, a voice somewhere to his right upped my bid by $500. The unseen bidder and I went back and forth for several rounds and the bidding quickly approached the amount that Dave and I had decided - after much discussion and deliberation - was the *absolute maximum* we could and would pay.

When the bidding reached our breaking point, I looked over at Dave, and he just nodded to go ahead and blew me a kiss. I raised the bidding through two more rounds, and she was ours! My only recollection is the sound of the crowd bursting into applause as I fell into Dave's arms.

I naively thought that the peeling varnish on the hatches was the biggest problem. While I took pictures and dreamed of beautiful sails, Dave set to work clearing the rainwater out of the bilge.

Figure 14 – Day one.

July 2000 – October 2001

During the first months of ownership we went through a series of mindsets. We initially planned to make repairs as needed to make her seaworthy and resell her. Early in what I still call the "delusional phase," we expected to be back in the water in about six months.

It only took a matter of days to realize what an exceptional vessel we were blessed with, and we understood that we needed to do whatever it took to make SARAH whole again. Thankfully we were able to complete a fair number of projects, and setbacks were weighed in the context of the big picture. However, as time went by, additional damage was revealed and more work and materials were budgeted.

In the first 14 months – working in the evenings after work and on weekends – Dave removed the engine and wooded the hull below the water line. I reefed the deck seams, refastened about 80% of the deck, and spent considerable time and effort refinishing pieces of the interior as they were removed.

While some of the interior was in remarkable shape, the majority suffered tremendously from the years of leaking decks, overflowing bilges, and general neglect. Of the 300+ ceiling boards, I managed to refinish 237 (refinished = *painstakingly removed-bleached-sanded-sealed-sanded-stained-and at least 7 coats of varnish applied*). Refinishing the ceiling was one of my first major successes. In an effort to save as much of the original wood as possible, I had taken each piece of ceiling and meticulously blended stain to hide the hundreds of spots where the wood surrounding the screw heads was discolored by electrolysis.

Dave built a steamer and had nine planks off when Tropical Storm Gabrielle dealt us a severe setback. When we made our first storm check, the wind was gusting a little, but nothing really seemed amiss. By the time we got down there the next morning, the wind was gusting to 30 mph, but no one seemed to think it was going to get any worse. Anyway, the wind continued to pick up and by mid-afternoon the situation was approaching critical.

Dave got back to SARAH just in time to see the canopy enclosure start to rip away. He cut the canopy free, and I got there in time to help secure lines to the frame, which was doing a heart-stopping Edward-Scissorhands dance around her.

We spent the night going back and forth checking on the boat stands and making sure the enclosure framework wasn't beating into her. The rain quit the next day, but it took several days for the winds to subside.

Amazingly, there was only ONE SMALL area on her cabin top that was damaged. She had an area approximately 8" x 4" where a piece of the broken frame rubbed, but other than the scratches in what looked like about ten layers of paint over cloth, there was no damage. SARAH's lucky star (and moon) certainly did good work protecting her.

Figure 15 - Damage from T/S Gabrielle.

After he cleared the storm debris, Dave designed a new frame for the canopy. The replacement frame was constructed out of heavy pipe, reinforced with square bar and welded at considerable expense.

December 16, 2001

This date is permanently burned into my brain because it is the date that Dave was diagnosed with lung cancer. He hadn't been feeling well for several weeks, initially coming into the house coughing and nauseous after cleaning up some of SARAH's keel bolts using a diluted muriatic acid bath followed by a fresh water rinse and then a wire wheel on the bench grinder. He was wearing a respirator, but thought that the respirator didn't fit tightly enough.

A couple weeks of various doctors' appointments, tests and ultimately a biopsy of a suspicious lymph node, the results, which I had faxed to my office, stated clearly: *adenocarcinoma of pulmonary origin*.

December 24, 2001

This is another date that is a part of SARAH's story. Although it was Christmas Eve, we were given an emergency appointment with Dr. Keith Justice, who was to be Dave's oncologist. When Dr. Justice told Dave that he needed to get his affairs in order and that he was looking at possibly six to eight weeks to live, Dave calmly replied, *"That won't do. I've got a boat to put back together."*

Although a widening circle of friends and family came to know the situation, Dave did not want sympathy or to make his condition public knowledge. He just quietly spent the next two and one-half years dedicating every ounce of energy he possessed to putting SARAH back together. When it became obvious that he would not live to see her sail, he simply worked harder, so that I would be in a position to complete the project.

May 2002

To raise the boat enough to allow work on the keel, Dave designed and had two heavy-duty channel iron jack beams welded. Each beam was made up of two 6" x 7' pieces of channel iron spaced 8" apart with 8" channel iron welded between them. On each end a heavy-duty piece of square tubing was welded across the top of the beams.

Figure 16 - Beams welded for lifting the boat.

Borrowed railroad jacks were placed on each end of the lifting beams. Just inboard of the square tubing on each end a heavy-duty 2" pipe coupling was welded in the center of the beam. This was designed to take a 2' heavy-wall pipe with a jack stand head mounted on top and braced to the other side with chain. (Figure 17)

Figure 17 - Railroad jacks used to lift the boat.

One jacking beam was placed under the deadwood just forward of the rudder. The other was placed just forward of the iron ballast on the keel. Pre-made wedges and blocks were used to help support the ballast on the way up. Pressure was kept constant on the boat stands. SARAH was raised approximately 10" to allow for two small railroad rails and an iron dolly needed to roll the ballast keel forward.

Internally, above the forward jacking position a brace was constructed with a 2" x 6" crossbar screwed to the stringers on each side and braced up to the sheer clamp. The goal was to add additional internal support because the forward bulkhead was partially disassembled and one frame on the starboard side had been removed.

When the ballast keel was removed, to support the ballast keel, keep it vertical, and move it forward, Dave designed an apparatus to hold the ballast keel as it was moved forward on rail tracks. (Figure 18)

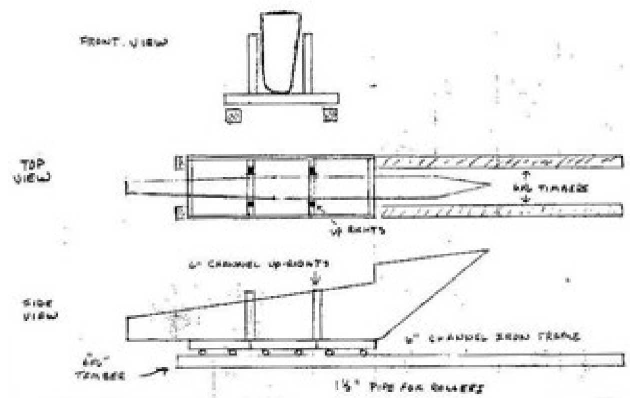


Figure 18 - Support structure for ballast keel

Over the course of three days, Dave used the Sawzall to cut 14 original keel bolts, two replacement stainless keel bolts, and the two lifting eyes.

Figure 19 - Moving the ballast keel forward.

Once freed of keel bolts, the ballast was moved forward on the tracks with a come-along attached to the yard owner's John Deere tractor. (Figures 19 & 20)


Figure 20 - Moving the ballast keel forward.

October 9, 2002

At this point, Dave had removed the deadwood, completed another half-dozen floors and approximately 20 frames. The next priority was to access the stern knee and try to repair a leak that had plagued the boat for some time. There was obvious damage from years of leaking in this area and signs of repair upon repair – one of the more creative of which involved 5200 and Linoleum!

In this photo (Figure 21) daylight is visible between the stern knee and stern post. It is no wonder there had been a slight leak under the engine.


Figure 21 - Twisted and checked stern knee.

It was obvious that the stern knee had checked and dried in a distorted twist, so Dave built additional internal and external bracing and proceeded to remove and rebuild the stern knee.


Figure 22 - Stern knee removed.

Looking at the twisted stern knee sitting on the workbench, it's hard to believe she even sailed straight.


Figure 23 - Stern knee sitting on flat bench.

Some of the twist probably resulted from the three years SARAH spent on the hard, but several floor bolts were broken and the floors were decayed. There were wedges driven under the floors to tighten them up, but with the broken floor bolts this just added stress to the planks. We removed enough cotton from the seams in this area to stuff a mattress. Another repair involved stainless all-thread used in an attempt to pull the knee back in place against the stern post. When that didn't solve the problem, a Dutchman was added on each side to close the seam at the rabbet. There was evidence of at least four major repairs.

It seemed a number of repairs were attempted but weren't successful because a total solution couldn't have been achieved without pulling the engine and removing the deadwood. It's easy in hindsight for folks to walk up and shake their heads at the mess, but for the majority of her life, we believe that SARAH was well cared for. But even an attentive owner with unlimited resources probably wouldn't pull the engine, **and** rebuild the whole stern of the boat because there's a leak in the lowest and most inaccessible portion of the bilge - at least not until all other options were exhausted.

December 2002

After the twisted disaster that was SARAH's stern knee was removed, Dave checked online and placed multiple calls trying to locate a suitable piece of wood for the replacement. There was a piece that had some potential at one of the saw mills Dave contacted in West Virginia, but that would have required us driving up there to get it. Counting stopping to see friends and family, we were looking at a four day trip total.

Dave managed to locate a potentially suitable piece here in Florida, but they wanted over $600. However, there was a large live oak on a vacant lot next to our house, and we often joked, "That'd make a good stern knee."

Figure 24 - Potential wood for SARAH's stern knee.

SARAH's lucky star shone through again when the lot was sold and a permit was obtained to remove some trees to make the property suitable for building. When the land clearing crew first showed up, Dave made quick and fast friends with a couple of the guys.

It was the second or third day of work before they got to the tree, but they cut it per Dave's specifications, and for a $20 tip to the driver of the front end loader, the wood for SARAH's new stern knee was dumped at the end of the driveway before I could even get out the door with the camera.

Figure 25 - Sealing the live ends of the freshly cut wood.

Now getting this rather large chunk of wood from the house to the boat was no small task, but where there's a will (and a series of levers, a hammer, wedges, and a come-along), there's a way.

Figure 26 - Loading the huge piece of live oak.

We got it to the boatyard and the yard owner picked it up with the boom truck and deposited it on the edge of the marsh. (Figure 27) He advised us that the tidal action would keep the wood moist enough to prevent checking, but because it wasn't completely submerged, it would not be in danger of infestation by worms. It was how they stored the wood for the shrimp boats, so it seemed to be a good resting place for SARAH's new stern knee.

Figure 27 - Lowering the oak into the marsh.

November 2003

Throughout 2003 Dave and I continued to work on SARAH as his health permitted. He completed various projects including fashioning a new 40" x 4" x 6" mast step, removing the cockpit seats and fuel tank, repairing two broken deck beams under the mizzen mast, adding additional vertical support below the mizzen deck and cockpit, completing several more floors and frames, and making a template and rough cutting the wood for the new stern knee (5' x 12" x 16").

March 2004

Much valuable boat time was lost in December, January, and February when we moved into a new home, and by March Dave's health had deteriorated to the point that some days he was unable to leave the house. He still stubbornly worked on small projects in the garage, and when he was too weak to do anything else, he would sit on a stool at the drill press and cut bungs.

July 2004

Dave was hospitalized on July 10th and it was obvious that he was loosing the fight. On July 13th I left the hospital around midnight and went down to the boatyard and let SARAH know that Dave wouldn't be coming back. I told her that the two of us would have to sort things out, and I repeated my promise I made to her the day we bought her, *that I would do my best*. I also upped the ante and promised her that I'd take her home to Padanaram.

On July 18th Dave left this earth and went to be with his oldest daughter and other friends and family that predeceased him.

August - September 2004

Just a few short weeks after Dave passed away, hurricane season took my mind off of everything else. I watched with a growing state of dread as Tropical Depression Two became Tropical Storm Bonnie and swirled into the Gulf of Mexico with all projections showing us in the path as the storm crossed the state.

When we rebuilt the enclosure after Tropical Storm Gabrielle in 2001, Dave designed the structure so that it could be dismantled in the event of another storm. However, we had built on a couple of additions, the screws and fasteners had been out in the weather for three years, and I didn't have Dave's skills for analysis and organization.

What I did have though were wonderful friends and a couple of quick phone calls generated not less than eight people, who rushed over and helped me remove the canopy and secure the worksite ahead of the approaching storm.

T/S Bonnie dissipated as she crossed the state, but Hurricane Charlie was right on her heels. Less than two weeks later Hurricane Frances bore down on us and Hurricane Jeanne came up the coast a week later. It is bad enough to watch a weather map and be in a hurricane cone; it is unspeakably horrible to be in one cone after another.

Thanks to Dave's preplanning, the folks who helped me dismantle the enclosure, and the Grace of God, SARAH emerged from the four storms completely unscathed and probably a little better for the thorough rinsing inside and out.

The only damage was what I inflicted on several vehicles driving through the flooded streets to check on SARAH.

During this time I reached out to IYRS, WoodenBoat Publications, and anyone I could think of in an attempt to hire a shipwright or someone with the necessary experience to help me complete the work on SARAH.

I seemed to have a fairly unique situation in that I had a project, materials, and tools, but lacked a person (or persons) with the skills to complete the structural work.

Clark Poston of IYRS, WoodenBoat's Maynard Bray and Tom Jackson, and several other folks went to extraordinary lengths to spread the word of my plight, but my hope that some talented New Englander would want to come to Florida and work for the winter never materialized.

Another reason I desperately needed help was that the owner of the yard where SARAH was located was in the process of adding a travel lift and erecting a new building. SARAH was becoming an increasing obstacle to the development of the property.

October 2004

In October I hired a local man, Jimmy James, who, in five short weeks, replaced the stern knee, crafted an awesome repair to the rudder post using wood recycled from the old stern knee, replaced the remaining 12 floors, replaced the deadwood, scarfed a large section into the keelson, moved the ballast keel back into place, and bolted the whole business back together.

Figure 28 - Ballast keel moved back into place.

The network of Concordia owners, friends, and others in wooden-boat circles was tremendous. A Concordia owner came down and helped out for a couple of weeks and another Concordia owner cut and delivered the oak that became SARAH's new deadwood. (Figure 29)

Figure 29 - SARAH's new deadwood.

January 2005

The situation at the boatyard continued to deteriorate, and although both neighboring yards offered us space, after seeing the changes in the current yard that occurred over a matter of months and knowing that I potentially had several years of work ahead of me, I leased a 50 x 60 foot warehouse, and SARAH was prepared for the move.

Figure 30 - SARAH's new home.

I had measured the doorway and SARAH's beam dozens of times, but I had not taken into account the angle of the driveway. We squeaked into the warehouse with mere inches to spare. (Figure 31)

Tom Wagner, TJ Wagner Trucking, was apologetic that he had to put SARAH into the warehouse at an angle, but the angle caused her to be strategically located under a large I-beam which proved useful during the cockpit rebuild and engine installation.

Figure 31 - Backing into the warehouse.

It was wonderful to finally have SARAH protected.

Figure 32 - The move was definitely cause for celebration.

As we were getting settled into the warehouse, another Concordia owner came down and gave a valuable week of his time helping me move the interior pieces from my garage to the warehouse, organizing the various parts, and removing the remaining interior. He made many contributions, but one of his most valuable was the suggestion that I have Capt. Paul Haley come down and do a mid-project survey.

It was March before that could be arranged, but Capt. Haley spent two days in the warehouse with us going over SARAH with his dreaded yellow crayon, and he helped me make many good and practical decisions regarding the project. He also pitched in and helped when, at his suggestion, James removed the cockpit floor for better access to some areas of extreme rot that needed repair. (Figures 33 & 34)

I don't think Capt. Haley was used to someone with James' speed. While Paul and I were at lunch, James took the Sawzall to the areas where the cockpit was still intact, set up a come-along on the I-beam overhead, and a rigged a bridle around the cockpit floor.

After the shock of coming back from lunch and seeing a major suggestion implemented wore off, Capt. Haley good-naturedly helped extract the cockpit floor, and it was lowered over the side of the boat.

Figure 33 - Extracting the cockpit floor.

Figure 34 - Lowering the cockpit floor.

For the most part James worked at the warehouse by himself. After working side by side with Dave all those years, I would have liked to have been more involved with SARAH, but James had done very well working by himself in the old yard, and he just didn't seem to need my help.

The routine that seemed to work the best was for me to show up on Friday afternoons with beer in one hand and my checkbook in the other. James would go over anything that needed my input – generally presenting a problem and his proposed solution, and I would agree with his plan.

September 2005

By September of 2005, James had pretty much completed all the structural work on SARAH and was ready to direct his attention to his own boat and his plans to go cruising.

October 2005 – December 2006

These were SARAH's loneliest months. After James completed the structural items, I felt the project was at a point where I felt I could finish the rest of the work. I had expended what was, to me, a tremendous amount of money in labor and materials over the past 11 months, and I believed the best course of action was for me to keep SARAH safe and dry in the warehouse and work on refinishing and reinstalling the interior pieces as time permitted.

Unfortunately time did not permit very often, and days and weeks went by with nothing accomplished. Days that I was able to get to the warehouse and work were often unproductive, because I couldn't find tools or materials I needed. Finally, a friend and I spent approximately 50 hours cleaning, organizing, sorting, and getting the warehouse and tool trailer to a point where I could find items and not go out and buy or order something I already owned.

One of the few projects completed during that time frame was the wooding and painting of the cockpit. James had rebuilt some of the areas on the cockpit sides and I wooded the existing seats and trim. (Figures 35-37)

Figure 35 - Cockpit wooded.

Figure 36 - Cockpit painted.

Figure 37 - Cockpit painted with seats reinstalled.

After six years, it was a triumph to finally be able to put a finished section back together. The other major accomplishment in this time frame was the building of a deck-level work platform. (Figure 38)

Figure 38 - Deck-level work platform.

The 8' x 12' platform gave me room to set up a work bench, epoxy station, and shelves to store materials. Doing so saved dozens of trips a day up and down the stairs.

January 2007 to September 2007

Frustrated by the lack of progress, tired of continually explaining the inactivity to the dozens of wonderful folks following SARAH's progress, and even more tired of paying monthly rent for the warehouse that I seldom visited, I started 2007 determined to move the project forward.

Several friends I had made through the Wooden Boat Forum came down and pitched in for days or weeks at a time. For the first time in over a year, SARAH began to see real progress. In January several minor projects, like removing the traveler from the bridge deck and repairing the attachment points, were completed. We also reefed and payed the remaining deck seams on the bridge deck and cockpit floor, the bilge was sealed with Clear Penetrating Epoxy Sealer (CPES) and painted with red lead, we installed the ceiling forward, and I made repairs to several of the beams under the cockpit.

With continued help from friends near and far, I began making repairs to the interior bulkheads, and I primed and painted the forward overhead. The remaining pieces of the head were wooded and repainted, and numerous interior pieces were readied to go back in the boat.

Putting the interior back together has been a real challenge and the folks at Concordia Company have been extremely patient and helpful, often responding to my frantic requests by photographing one of their boats and e-mailing me pictures to use for reference. With their help I've solved several mysteries.

I had taken thousands of still and digital photos, but inevitably I did not have the pictures I needed when it came to re-installing many of the estimated 3,000 pieces. Also, because there were so many new floors and frames, there were no "clues" as to how many of the interior pieces were attached.

Even more progress was made beginning in May, when Jimmy James returned to St. Augustine and signed back on with the project.

With typical speed and fineness, James promptly completed projects like sanding and fairing the ballast keel, preparing the engine bed for installation of SARAH's new engine, making backing plates for and installing all new thru hulls. He also added additional supports under the cockpit. (Figure 39)

Figure 39 - A forest of additional supports under cockpit.

I tended to the myriad of details involved in bringing the project together, caulked the hull below the waterline and started sanding and painting the mizzen mast, main boom, mizzen boom, and club foot. Another of my Wooden Boat Forum friends flew down for a week and finished the painting. Somewhere in this time frame, I came to terms with the obvious fact that there was not going to be time to reinstall the interior. I quickly realized it was probably better to go back in the water and then work on the interior.

We suffered a considerable setback in early September when, after reinstalling the rudder, the alignment was off and the upper bronze pintle broke. Once again, SARAH benefited from the continued existence of the Concordia Company and the fact that they have castings for almost all of the parts and some spares on hand. In this instance, not only did they have an upper pintle, they had three on hand – one of which was promptly shipped to St. Augustine.

On September 15th SARAH's new engine was installed without incident.

October 2007

I selected the last Saturday in October, October 27th, for SARAH's launch. As the launch date approached I logged 209 hours; James worked 144 hours; Owen Huntington, who did the engine installation and electrical system, worked 34; Davis Murray spent 59 hours working on the rigging; I paid 29 hours of paid casual labor (painting, caulking underwater seams, taping off deck seams); and 51 hours of volunteer labor were donated. So, after seven years of working on the boat, it took an additional 500 hour push to get her in the water.

October 27, 2007

Tom Wagner, TJ Wagner Trucking, returned to take SARAH out of the warehouse and deliver her to St.

Augustine Marine. At approximately 9:30 am SARAH emerged from the warehouse. (Figure 40) She certainly pulled forward easier than she backed in.

Figure 40 - SARAH leaves the warehouse. Photo by David Gage

In the short distance between the warehouse and the marina, we got caught in a complete downpour. I had not thought about closing the companionway, and by the time we got SARAH in the water, there was as much water coming in from the top as the bottom.

Figure 41 - Launching in the pouring rain. Photo by David Gage

The wreath SARAH had been given for good luck suffered a bit of damage when we decided at the last minute to remove the bow pulpit, but SARAH was finally back in her element.

Figure 42 - SARAH finally back in her element. Photo by Kristen Repetti

Using a suggestion we picked up from a Giffy Full seminar at the 2002 Wooden Boat Show, five days prior to the launch we draped the boat in plastic and put a humidifier and a half-dozen tubs of water under the boat to pre-swell the boat. After years out of the water, she hardly leaked at all. Within a few hours the rain quit, and we pulled her around to her slip.

We also made the front page of the local newspaper.

Figure 43 - *St. Augustine Record* Monday, Oct. 29, 2007. Courtesy David Gage

COSTS: OWNER-COMPLETED RESTORATION VS. PROFESSIONAL REBUILD

Over the years as work continued on SARAH, I did my best to keep the receipts for materials and purchases. Fearing the total would be a depressingly high number, I did not total them until I began preparing the groundwork for this paper.

The cost total (Figure 44) is fairly detailed, but far from inclusive. Over the course of seven years it is inevitable that receipts were lost, and when I went to enter the information, many of the receipts that were retained were illegible. All along, I expected that the total costs would be roughly equal to the amount we would have spent if we had had SARAH shipped to New England and had the work done by a professional yard.

It is hard to say which would have been better. If we had shipped SARAH to New England, I expect the work could have been completed in six to twelve months, and we would have been sailing long ago. On the other hand, spending tens of thousands of dollars was made much more palatable by being spread over seven years. In my case, it was the best way to mange it.

S/V Sarah
Rebuild Costs
2000-2007

Category:	Total:	% of Cost:
Purchase price	$14,000.00	6.48%
Boat equipment*	$11,885.93	5.50%
Materials	$10,291.48	4.76%
Tools	$9,193.67	4.26%
Consumable items	$8,360.92	3.87%
Support items**	$7,873.65	3.64%
Miscellaneous***	$9,893.93	4.58%
Storage/Rent/Utilities	$69,587.95	32.20%
Labor (2500 hours x $30.00 per hour)	$75,000.00	34.71%
Total:	$216,087.53	100.00%

Figure 44 – Rebuild Costs.

* Boat equipment includes $10,000 for the new engine and installation.

** Support items include the canopies, ladders, shelving, and tool trailer.

*** Miscellaneous items include survey and insurance costs, photo processing, shipping charges, and the like.

What is not included in the total is the value of Dave's and my labor. Since I worked over 200 hours in October before we launched, I think 2,000 hours is a **conservative** number of hours of owner labor. Also not included are several hundred hours of volunteer labor and numerous items donated to the project like the deadwood and recent items like an autopilot and sails.

The full spreadsheet had over 800 entries – Home Depot purchases, Jamestown orders, marina bills, and everything in between. That's 800 trips to hardware stores, internet orders, and telephone orders. 800 x 10 minutes per item = 8,000 minutes or 133.33 hours spent procuring materials and keeping the project going. The hours are easily double that, because it is a rare day that anyone can get in and out of any store in 10 minutes. If you count travel time, double the new total or 533.33 hours devoted to purchasing materials, tools, and managing the project.

As I was working on the costs spreadsheet, I came up with the following individual totals:

191 board feet mahogany
440 board feet oak
4,250 screws (#14 and larger)
9 gallons of epoxy
16 gallons of paint
16 quarts of varnish

Already costs exceed $215,000.00, and I have several big-ticket items like electronics, new standing and running rigging, and sails that still need to be purchased. Also, now that she is back in the water, there is ongoing maintenance that I didn't have when we were in the shelter of the warehouse.

I share these with you not to dissuade anyone from taking on the task of restoring a classic vessel, but to convey that it takes more than just a certain number of board feet of wood, boxes of screws, gallons of epoxy, and quarts of paint and varnish.

If you are considering the rebuild or restoration of a vessel, even a small project like a skiff, the best decision and the one most likely to be pursued to completion should based on as much information as possible.

IT TAKES A COMMUNITY TO RESTORE A WOODEN BOAT

When we first purchased SARAH, we received several random e-mails from other Concordia owners welcoming us and offering encouragement. The folks at Concordia were instantly helpful and have been a valuable resource over the years.

Our support network rapidly expanded when I stumbled into the WoodenBoat Forum, an on-line forum sponsored by WoodenBoat Publications. Without the wealth of information and knowledge shared on the

WoodenBoat Forum, Dave and I could not have done what we did. At the time of Dave's death and since, legions of Forumites have offered support and encouragement. Many on-line relationships that started with the mere exchange of information on an isolated subject have blossomed into personal friendships that I will have for life.

In 2005 I attended a fundraiser for Chapman's School of Seamanship in Stuart, Florida, and Halsey Herreshoff was the guest speaker. During a conversation after the program, he mentioned the upcoming symposium and pulled a registration form from his jacket pocket. That led to my attendance at both Classic Yacht Symposiums, the beginning of many new and valuable associations, and my presentation of this paper.

If it is your desire to build a vessel or embark on the rehabilitation of a classic wood boat, I absolutely and positively encourage you to consider all the factors as they pertain to you, make careful and well-thought-out decisions, budget appropriately, and then once a sound decision is made, doggedly give 150% to making your dream a reality.

CONCLUSION

SARAH is in the water, and once again I am blessed to have someone in my life who encourages me in this endeavor, who I rely upon as I make important decisions, and who has provided more help than I can begin to acknowledge. The love affair truly continues.

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Concordia Company, Inc.
<www.concordiaboats.com/history.html>

ABOUT THE AUTHOR

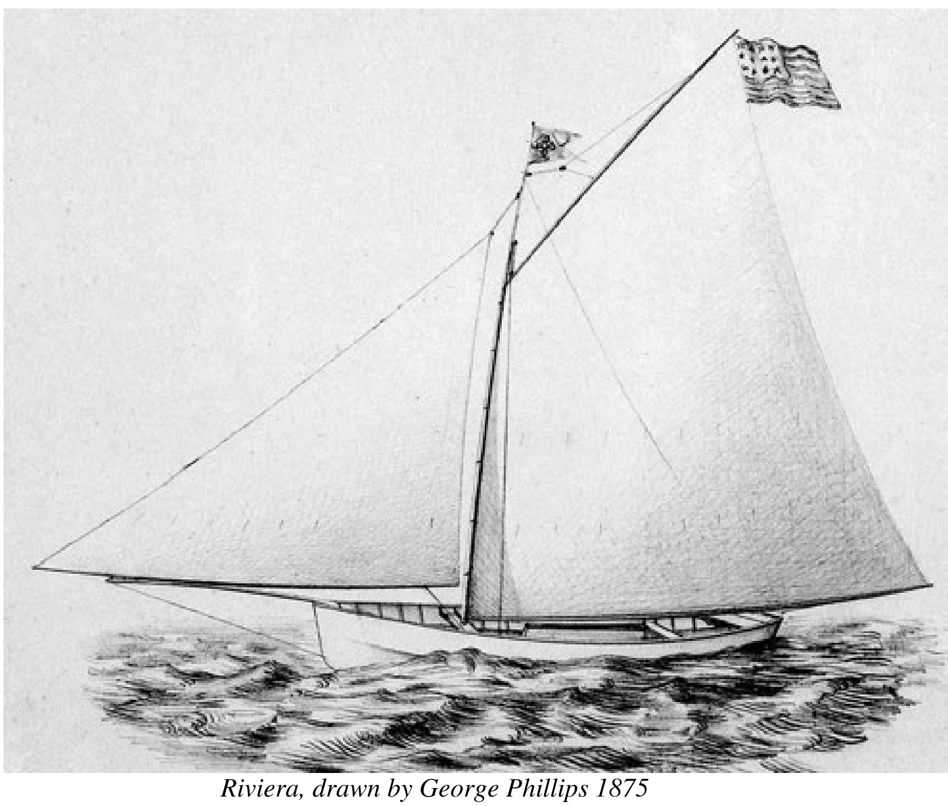
Margo Geer moved to St. Augustine in 1989 and bought her first sailboat in 1995. Attracted to boats and the water, she founded St. Augustine Boatworks in 1997. Through St. Augustine Boatworks she maintains a presence on the waterfront doing brightwork and detailing boats for Hunter Marine. This relationship has led to many opportunities to crew in various races and on deliveries. Margo is a member of the St. Augustine Yacht Club and is looking forward to campaigning SARAH in various local races and events.

Riviera

Nathanael's European Education

Michael Hanyi
Owner

Photos by Author unless noted



Riviera, drawn by George Phillips 1875

INTRODUCTION

Long before the birth of the Herreshoff Manufacturing Company (HMCo), Nathanael Herreshoff (NGH) and John were already constructing boats.

In the winter of 1873-74 NGH was holding down a full time job for Corliss Steam Engine Company, at the time the world's largest, in the evenings and weekends he assisted his brother John's ventures by designing steam vessels, not to mention assisting the patents of his brother Jame's inventions. He was showing signs of fatigue, and was told to take some time off. He decided to join his brother Lewis who was abroad staying in Nice with his cousins. At 2:40pm on February the 10th, Nathanael departed New York on the GOETHE. The ship stopped briefly in Plymouth; then Nathanael disembarked in Cherbourg and the ship steamed for her home port in Hamburg. He stayed briefly in Paris, as without a harbor or shipping, Paris had little to offer other than his 2-hour visit to the city's pumping station. He was soon heading south by train. Along the way the line soon runs along the Saone, which joins the Rhone, which flows to Mediterranean. After several days of watching barge and steamer traffic on the rivers he arrived in Nice on the 23rd of February. With the sea only a few minutes walk away, it took Nat only 3 days to purchase a slide rule. The first boat he built was L'ONDA, which was launched on April 6th, a simple double end skiff which he sailed as far as Cannes. Boarding in the same house was a Mr. Mahoney from Dromore, Ireland, who was traveling with his Rob-Roy canoe. I believe the scenic journey by rail down the rivers and along the coast, together with Mr. Mahoney's stories, were to inspire Nathanael to construct the boat that would take him homeward bound. He also brought home his new knowledge of boat construction that would inspire his method of constructing light wooden hulls.

THE CONSTRUCTION OF RIVIERA

RIVIERA as all of his designs, was first carved from a block of wood. As he now held some local knowledge of services and materials available, he chose to design a hard chine as there was no wood fit to steam for framing. When he was satisfied with the half-hull it was traced onto paper, where he decided to raise the sheer 8 cm before taking off the measurements, and doing the displacement calculations. The sail plan and sail cutting drawings followed.

RIVIERA was launched on June 28th, and he had almost 3 weeks to tune the boat before setting off west for the mouth of the Rhone. It should be noted that the L'ONDA and RIVIERA were drawn, calculated, and constructed in metric, which shows that already young Nat chose to work with and not against European practice.

"You know there was a boat called RIVIERA which was the predecessor for COQUINA." Kurt Hasselbalch told me, during one of several lengthy calls in 1999. At the time I was completing the construction of the *first* Coquina replica COQUINA II. He briefly told me details of the journey. As I lived in Finland I could not easily travel to Bristol to do all my research. My dear old Dad traveled to The Mystic Seaport and Herreshoff Marine Museum to do some photographing for me; on the trip he purchased the newly released *Recollections* which gave me the greatly needed sail plan for COQUINA, and at same time introduced me to RIVIERA.

In 2002 I met Halsey Herreshoff while working P.R. for the Kotka Woodenboat Show, and asked him about RIVIERA, to learn that the half hull existed and he would gladly measure it for me and invited me to visit Bristol to research the boat. As Elizabeth Meyer was a good friend I was invited to stay in Newport with her. After almost a week of research I uncovered and made copies of several drawings including measurements of the hull, rig, sails and spars, but many dimensions and details were only recorded in Nat's head.

I wanted to sail RIVIERA in 2004, but as funding and time were tight the copies got shelved along with other dreams. But some dreams become nightmares and in January of 2005 I heard through the grapevine that Halsey was claiming he was going to start construction on a RIVIERA. As I had 3 overseas flights and research visits invested with exceptional results I was sitting on a lost piece of history, I was the first to look through the Love Rocks collection, [The NGH Collection housed at the Herreshoff Marine Museum]. It was thrilling. I consulted Eliz what to do, "Finish your documentation, get it published and put your foot down as the researcher."

At home in Finland, our unfinished bedroom was converted into a makeshift office. I started writing and checking factual information; for inspiration I pinned the RIVIERA image over my desk.

It was difficult to not look at the plans and concentrate on the voyage, which is as equally interesting. One night in my slumber Nathanael visited me, coaxed me awake with his stick and told me **"Well son, you got the plans, the log, my financial accounts of the trip, let alone my washings list, what more do you need other than a swift kick!? If you let someone else build her you will regret it for the rest of your life!"**

The following day I reconsidered construction. My COQUINA II had a down payment on her, I had no sailboat even though I would not call RIVIERA a family boat, which was what we needed. With the thrill of getting her built and launched before Halsey's boat as a rewarding carrot I started the initial time and financial projections needed to make the decision to go with the construction. As I was not a boat builder at the time and have learned from the past "*You get what you pay for*" and "*If you want it done right…*" I consulted several builders that I could work with to hear the common answer "no time" or "too late in the season." It was a difficult situation but shipwright and friend Allan Savolainen of Red Sky Craft told me to start lofting as the drawings were incomplete and not usable by a builder, "thinking costs a builder time and you money", said Allan.

I noticed that the new bedroom was just long enough to fit the boat in, which raised my wife's eyebrow. I decided to loft her on masonite sheets which could easily be transported afterwards. Maynard Bray was eager to help, and I was eager to have him as consultant; I wanted to have my RIVIERA replica as authentic as possible. It is of the highest honor to have a Herreshoff design boat "Bray approved". Together, armed with every known document and book published and unpublished on NGH we started deciphering.

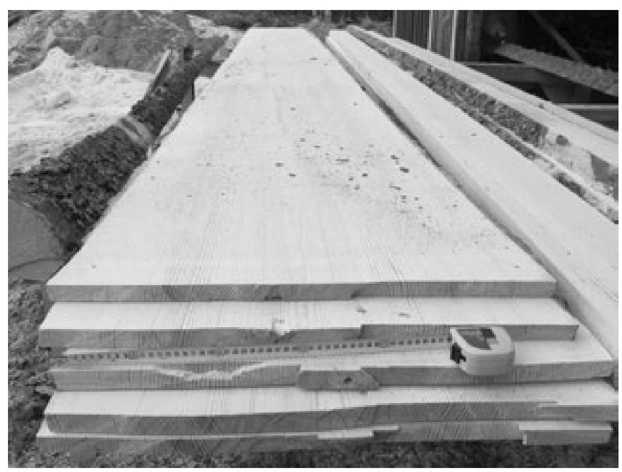
First came direct transferring of the drawing for profile, but when it came to the frames the problems started. There was no width of rabbet given and the frames came together causing my first real conflict. On my visit to Bristol in 2002, I measured the half hull using two business cards and a paperclip, I rechecked NGH's measurements to the half hull and they had no more than one millimeter discrepancy, We decided to add a reasonable width to the rabbet and not to the sheer or chines. Next came the question of what dimension. I looked carefully at the building plan; it is filled with small notes and angles. Under the boat were several series of numbers; I chose one set, 1,22,23,23,13,8 with no explanation. They were not measurements to a lower baseline as it did not add up I decided to try them as the rabbet widths and with the exception of frame #1 they worked out perfectly.

The original drawing was drawn 1:40 and at this scale there is a lot of possibility for error. Sometime during our think tank sessions Maynard and I concluded that she was built upside-down as there were no measurements under the boat and the baseline was drawn over the hull, which makes RIVIERA NGH's first boat to be built upside-down

In March as I could not find a reputable builder to take on the project, Allan came up with a solution; I build her in his shop under his supervision for rent of the space and 2 hours of his time per day, as he knew he would be bullshitting at least that much each day teaching me.

RIVIERA was originally constructed of only two lumber species, mulberry, which is plentiful but impossible to purchase, and Norway pine. NGH stated he purchased rough cut timbers, and contracted men to whipsaw them into planks. Well, this detail was omitted for obvious reasons- our hardware store was fresh out of whip saws. Living in Finland has its advantages; RIVIERA planking was said to be 23cm wide by 7-8mm thick. Finding Pine of that size was easy but Allan does not like the idea of using flat grain in planking. We took a trip to Stamholz, a firm specializing in cutting and drying only knot-free pine for European furniture manufacturers. The owner Mr. Alpo Paajanen knew we were coming and directed us to some fresh cut logs which turned out to be 80cm too short and not exactly the correct girth. "I'm going to the forest next week; I think I know exactly the tree you want" he claimed. Soon enough the call came to Allan "How long do you want?" 5.4m was the answer. We were informed to come the following week when the next delivery arrived. In the meantime I decided on using elm for the frames as it is very strong, has a similar color and glues well. The 5 frames were laminated to create perfect knees; in *Recollections* NGH states that they were 12 x 40mm and that they became.

Allan Savolainen next to the tree felled for the project



RIVIERA'S planking stock, 35cm wide (13-¾")

It was April 15th when we returned to the sawmill. It was quite obvious which was "our" log that measured over 80cm round. Mr.Paajanen ordered our log next inline to the sawyer snd I could not resist the Slim Pickens act. We wanted vertical grain and that's what we got. As we purchased the entire log, Allan carefully planned all cuts. Three hours later they were stickered and loaded into his state-of–the-art, 4-chamber kiln which is completely computer controlled. After two weeks the lumber was ready to be picked up; it was at 6% moisture content and surprising to see that there was not one check from drying in the whole batch. We were able use the full length of the lumber less only 4mm of the original chainsaw cuts. Back in Kotka, I was assembling the frames with the floor, and Allan started carving the rabbet as I felt my skills were not good enough yet. Allan and I decided on the floors thickness, which was also approved by Maynard, along with the inner and outer keel dimensions. NGH stated he could not steam any wood, and our pieces could be manipulated into the required curves, but we decided to use steam to relieve the tension in wood.

RIVIERA, ready for planking with secondary framing installed.

Somewhere in this time the concept of originality was discussed. I laminated the frames because I had no other choice. The pine was excellent and second to none, most likely better then the wood NGH had. We had modern machinery and access to modern materials, including epoxy. I decided that the use of the stuff to be strictly limited (other then the laminated frames) as it is too easy to get carried away and create a modern construction.

Allan at first thought I was a bit too meticulous constructing the building platform, but later saw my half-millimeter tolerance pay off in the planking.

The chine logs were also a mystery, so again we looked at other NGH works for guidance. Another question was "gunwales" and Maynard and I had to make the most accurate decision. Since NGH did not mention any hardwood other than framing stock we limited our use to attempt to keep the weights in check as we were charting unknown territory. With the frames setup, and the inner keel installed Maynard unearthed the *only* known photograph of RIVIERA. It was an image taken in the 1880s when she had her Dandy rig, but secondary framing was very clear. Using scaling dividers we agreed that there was a frame every 40cm, double what was in the plans. I installed these in place from straight 40 x 12mm stock; Maynard said they looked too heavy for secondary framing, compared to WATERLILY's tender. They were clearly installed after planking was completed. I reduced them to 30 x 12mm and they looked "right".

The Original RIVIERA with dandy rig. Taken around 1885

One mistake in my COQUINA II was the mast step which waited until after she was framed and planked; I addressed this area before continuing. As RIVIERA has a very thin keel, planking, and framing, there is not much to brace the unstayed mast to. As COQUINA, RIVIERA has 2 mast steps and I decided on running an elm plank down several floors, to distribute the load over the entire bow of boat for strength. Both floors and mast step plank are mortised, taking load off the fasteners, a design I strongly recommend.

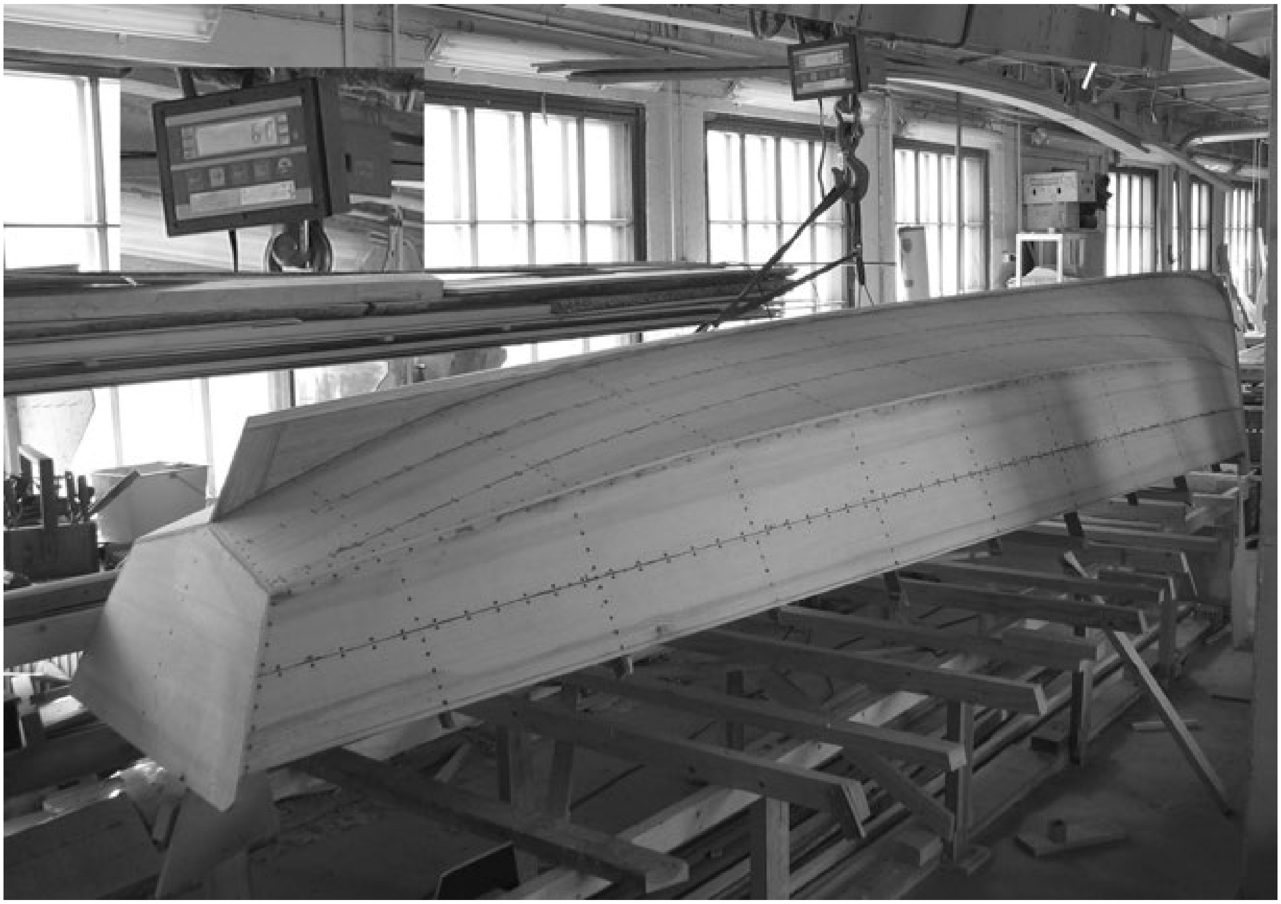
Planking

After resawing the one inch thick boards in half, they were planed down to 7 and 8mm and cut 23cm wide as NGH ordered. I followed Allan's advice by investing in 4x8 sheets of masonite for pattern stock, ripped them to 23cm and tacked them together to make patterns; I had the garboards done in no time. NGH said 3 planks on the bottom and 2 on the sides. Now the aft runs were fine and the mid section a wee bit close but the real problem came in the stem - it is impossible to get them to wrap up. Allan said there are two ways around this: end the mid plank on the chine or make stealer planks. "Stealer planks?!" I asked, "isn't that like cheating? Sounds like something that doesn't sound fair!" Maynard said they should end on the chine, just like on WATERLILY's tender, which still exists and gave so much insight into the missing construction details.

Detail of battens ending into the chine.

She and RIVIERA were both battened seam hulls and riveting her upside-down looked quite difficult and tricky based on the thicknesses involved. NGH mentioned he had screws available so we tested the strength of a 4x16mm bronze screw vs. a countersunk traditional rivet connecting 8mm thick test pieces. The nail head ripped through the planking easier than the threads ripped out of the batten. **And so Maynard and I agreed that RIVIERA must have been the first screw fastened boat that NGH constructed.** All mating surfaces were painted with red-lead prior to being bedded with Dolfinite. Planking went pretty quickly; Allan showed me how to mate the planks at the chine, which was quite interesting. After the shutter plank (or whisky plank) was installed, Allan installed the last screw and we celebrated with a shot of whisky. This is a tradition in Finland best left until after working hours as a shot normally becomes the bottle.

The next morning two small holes were drilled through the keel and 1/8 spectra line was threaded through.

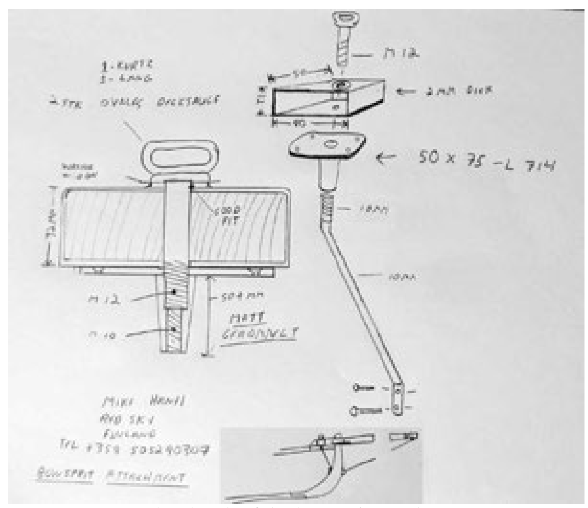


Cut loose and weighing in

RIVIERA was cut free from her building platform and lifted up. The scale read 57.6 kilos, (126 lbs); we had 32 more kilos allowed on RIVIERA's diet and had to be careful with any unneeded weight. It was the beginning of July and the hard reality of completing the boat to sail in 2005 was difficult to accept. After 4 months of working 10 hour days I decided to take some time off from the project and spend some quality time with my family, which I only saw on weekends as they were over 100 miles away.

In late August I resumed construction. The centerboard slot was cut and she was flipped over. The centerboard case construction was straightforward, and lined with brass strips to protect the paint from any and all abrasion. One of the issues that was forthcoming was the bowsprit design, which had to be easily removable, but not necessarily while onboard.

NGH wrote "bowsprit outboard 2.25m…" and according to the drawings only 20cm inboard. Now I'm no mathematician and never calculated the leverage on the unstayed sprit, but with a jib of 7.25m² (78sqft.)-over 2 meters out there attached to a breasthook with 8mm planking around it was not going to be easy.



The sketch of the bowsprit attachment

Another motto that came out during construction is "the simple solution is the correct solution." I recalled COQUINA's lifting eyes on the fore and aft deck and came to an idea. I sketched up a sheet bronze fitting and sent it to Maynard for consult, **"Yes, that looks mighty Herreshoffy, go with it**" and the drawing was sent to Germany for construction. I chose GD BOOTE for all of the fabricated bronze work, which was delivered quickly for fair prices.


Bronze straps reinforce the stem from the strain of the bowsprit.

After the breasthook was shaped a mockup bowsprit was attached.The inner end seemed well supported. The stem end of the affair was adapted from a Delaware ducker which was on display at the Independence Seaport Museum (ISM) in Philadelphia. Small bronze side plates were riveted thru the stem sides and screwed to the sides of the sheer thru the rubstrake.

Many other helpful details of construction from the 1870's were noted on ISM's TUCKUP and DUCKER on display.

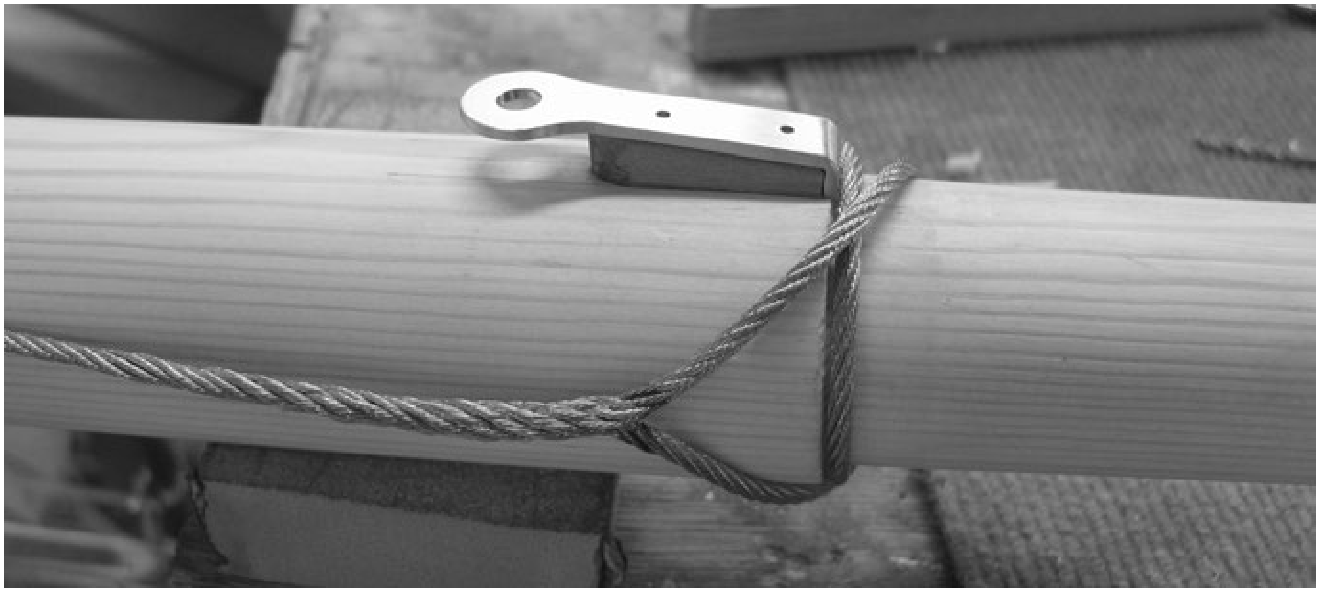
At this stage I recalled the horror of painting and varnishing COQUINA as a complete boat. Allan believes in finishing while constructing, and it makes sense. When the time came, the inside was painted with red-lead primer before choosing a topcoat. I had heard about "*Herreshoff Green*" a.k.a. "*ALERION Green*" Maynard suggested I contact Peter Vermilya at Mystic, who I was told had an original tin of the stuff.(?!) Many years back the museum duplicated the color when repainting ALERION, which is on display at the Mystic Seaport. Peter said he could get me some mixed up but with costs of hazardous material transport, it made more sense for him to send me a brush-out on a piece of plywood. This was sent to ULLA paints in Finland, which only manufactures traditional paints. They were happy to assist on such an interesting project. RIVIERA's original interior color is lost in time, but *Herreshoff Green* is a beautiful color.

Another facet of the boat was the sails, which NGH made a very complete drawing of, but again there was a conflict. On his profile drawing the sails were larger than on the sail cutting plan. As a friend of mine owned a loft, he reviewed the drawings and pointed out the calculations NGH made for purchasing the cloth, and the details of the shape which only a sailmaker could notice. I concluded the boat ended up a plan based on all the calculations NGH made. To make the sails, Nat Wilson was the only real choice as he has built more sails for Herreshoff yachts then any other sailmaker. He was enthused about the project. I wanted them light and *Oceanus* cloth was far too heavy. "I'm dreaming of 4-5oz cotton sails, but I know thin cotton has not been produced for about 40 years" I said. Nat informed me that he was having 5oz cotton cloth produced in Scotland especially for him. Nat wanted to use tarred hemp for the ropework and I remember seeing some of excellent quality here in Finland. On my father's next visit to Finland my sails arrived.

Sparbuilding was rather a pleasant experience as it is mostly handwork. In Bristol I noted that several original spars were square in shape and not round. Allan agreed that it would be easier and stronger to build them this way. Another thing I noticed was almost all the Herreshoff small craft spars were free of holes. RIVIERA was to have no screwed-on spar fittings, just rope grommets and small wooden keys to keep the bends and hitches in place. NGH did not have access to a chandlery and in fact he even had the cordage made to his specifications on the beach at Nice. Once again I demanded natural materials for the rope. Hemp and cotton of quality are not the easy to find, but a traditional marlinspiker in Stockholm had exactly what I needed. For standing rigging, the only choice was 3mm bronze mining wire, which I had hand-spliced in Finland by a master rigger. To a master rigger, yachts are only a small part of his trade and Claus Hendrich of Baltic Rigging was honored to do RIVIERA's simple rig. "It was like working on jewelry" he stated.


A genuine Herreshoff gaff jaw (left) next to RIVIERA's (right)

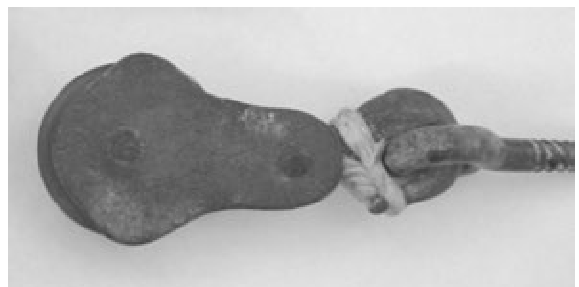
Only the oarlocks were off the shelf hardware, the rest was fabricated from sheet bronze. In *Their Last letters* NGH mentions 14 blocks with bodies of sheet brass, I decided I wanted to make replicas of these also. Sheaves were purchased, and the housings were designed on computer in the fashion of an original HMCo sheet bronze block, which I have in my collection. 0.8 mm bronze sheet was sent out to be water-jet cut; the beckets and hooks I made up from brass rod. Assembling them and polishing them was a labor of love



Handspliced bronze mining wire suited RIVIERA's rigging well

RIVERIA's interior – primary laminated framing and secondary framing

Interior details



An Original HMCo sheetbronze block

RIVIERA's sheetbronze block

By spring of 2006 my RIVIERA was looking great; I saw 2 winters pass from the shop window. The ice came and then melted away, boats were launched and then only moments later hauled as the ice formed under them again. My Son Nathanael had aged a year during the process. With the boat ready to leave the yard there were a few things left to do, such as complete the paint and varnish, assemble the blocks, leatherwork, and rig the boat. During Easter RIVIERA got her bronze bottom and several coats of paint. Unfortunately another obstacle appeared between her and the water: my empty bank account.

If I calculated lost wages, materials, rent and Allan's fees I was well over 30,000 euros…but I got a perfect boat, with no flaws, with no compromises, done exactly as I would want her done, one that I could and would show proudly to my peers. My first boat-RIVIERA!

Over the year I had become useful to Allan by practicing my other talents in yacht electrical and mechanical skills. Allan hired me for the rest of the season, as he stated, "I trained you. If I don't trust you to work on my clients yachts, then I am at fault."

In the Fall of 2006, I enrolled in the Kuggom School of Wooden Boatbuilding, Finland's oldest. The school teaches in Swedish language, which I had to teach myself. Not as large a challenge as learning Finnish, which took me 5 years.

As I was a more "advanced" student then the others, I chose to build something a bit more challenging;
a traditionally built Whitehall with Herreshoff type planking and details.

RIVIERA came to school with me, and was completed in the winter of 2006-7. She was yet to be named and RIVIERA was the only choice. On a small index card NGH had saved from Corliss, found in the left middle drawer in his desk, was a small thing of beauty. A doodle of RIVIERA sailing upwind in a squall, with her scandalized rig, which is described vividly in *Recollections*.

Her name was shown arched across her transom.

RIVIERA

Font was taken from NGH's 1873 guidebook

I only needed to choose a font type to complete my masterpiece. In my opinion fonts are personal. After viewing several of the period which were too elaborate or common I remembered the small 1873 Appleton's European Guide book which NGH turned to on numerous occasions to provide direction and shelter during his European journey. In the advertisements I discovered the perfect simple font, which I scanned, enlarged and cleaned up. This was hand painted on the stern with black paint.

RIVIERA was launched with little fanfare with Kotka coworkers; a bottle of Mount Gay Extra Old was chosen for the task. Amusingly, just as the America's cup yacht DEFENDER had done in 1895, RIVIERA stopped half way into her element. There was a large stone under the water, which had to be cleared. RIVIERA was first sailed with only the mainsail, which in the dying breeze made her amazingly swift. The following day the opportunity finally came to properly dress her with both her sails. With Allan at the helm we pushed off into history. RIVIERA sails again.
She is very pleasant to sail, with 2 comfortable thwarts, and a perfect helm. I have sailed her 4 times, only once with full sail. Last summer a table saw injury prevented me from starting the journey. I was fortunate that I did not lose a finger, but the sensation is gone.

I was feeling blue when Allan called me up and invited me to head the archiving and dismantling of the original interior of T.O.M Sopwith's 12 metre BLUE MARLIN. Yearning for the Med must have sent out signals, for one hot afternoon in the bilge Nat Wilson Jr. rang me and told of his new position as Bowson on the Herreshoff Schooner, ELEONORA [Replica of WESTWARD HMCo #692]. "We need racing crew for a few weeks, can you come?" Miraculously my finger healed within the 4 minute call. It was a joy to sail a big schooner after so many years away from classic yachts.

This summer with help from friends and sponsors
RIVIERA *will* see the Med.

Finished details

ACKNOWLEDGMENTS

Many thanks to Halsey, and Nathanael Herreshoff III, for granting access to the NGH documents, which allowed this to happen.

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ABOUT THE AUTHOR:

Michael Hanyi, an American is an occasional journalist, and boat builder specializing in research, systems installation and joinery. He is an avid classic boat enthusiast and is currently employed at RED SKY craft in Finland restoring BLUE MARLIN, a 1937 12 Metre designed and built by Camper-Nicholson for Sir Thomas Lipton. Michael has lived in Finland for 10 years and has finally found himself- as a boatbuilder.

ANNIE: History and Rebirth of a Sandbagger

Quentin Snediker
Director, Henry B. duPont Preservation Shipyard
Mystic Seaport

Figure 1 - ANNIE, under sail in her new life, September 21, 2005. Photo, Kane Borden, Mystic Seaport

ABSTRACT

This Paper will focus on one of the most beloved vessels in Mystic Seaport's watercraft collection, now totaling over 500 watercraft – the Sandbagger ANNIE. ANNIE's revered position among so many vessels is due in large measure to her being the first watercraft to be collected by the Marine Historical Association, now Mystic Seaport, founded in 1929; ANNIE was acquired in 1931. ANNIE's provenance and importance to Mystic Seaport are further enhanced by her having been modeled and built on the Mystic River by D.O. Richmond for Henry Tift of Mystic, CT; and Tifton, GA. She was actively campaigned in Eastern LI Sound and in Florida and Savannah, where she was shipped in winters.

Racing Sandbaggers was popular sport before 1885, a time when length was the only handicapping criterion. Owners could carry as much canvas as they dare. Large crews and 50 pound sandbags as shifting ballast made for exciting racing and fierce competition. At 28'-4" on deck and a sparred length of 71 feet, ANNIE was a large vessel and competed with other large vessels as Class A sandbaggers.

Through her years of active sailing she was much modified to improve sailing qualities and rebuilt at least once because of fire damage. After becoming a collection vessel she went through two restorations, and was again modified simply due to a lack of information. In her most recent restoration, which reflects both the evolving nature of maintaining the highest degree of historic integrity and valuable information only recently discovered, ANNIE now represents the closest she has ever been to her historic form.

Since the completion of this recent restoration, ANNIE has been actively sailed in local waters. She provides both an academic understanding of the nature of handling of such extreme historic craft and the absolute thrill of a crew working together to maximize performance.

This paper will portray the story of her history, evolving preservation, recent restoration and the research that lead to her current status as one of the most significant vessels in Mystic Seaport Museum's collection.

SANDBAGGER ORIGINS

The vessels which by the last half of the 19th century became commonly known as "sandbaggers" had their origins in the working oyster sloops of New York Bay. As with most working vessel types, rivalry between captains and crews manifests itself most strongly in the expression of speed. As today, whenever two or more boats find themselves sailing in company ultimately each strives to out-sail the others. By 1840 among the oystermen of New York these rivalries became organized races. This was rough and ready racing with a strong working class background. Racing always involved heavy wagering, drinking, and, of course, extreme sailing.

By the second half of the 1860s this extreme racing had caught the attention of yachtsmen and came to involve professional crews and substantial prizes.[1] Late in this decade, due to waterfront development in NY harbor and increasing interest in these craft, racing began to shift to Western LI Sound and soon all the way to Boston.

In the 1870s and 1880s sandbagger racing spread south, first along the NJ coast, then on to Delaware Bay and Philadelphia. Eventually Charleston, Savannah and New Orleans supported fleets, many vessels having been sent down from New York.[2] Dixon Kemp in his "*Manual of Yacht and Boat Sailing*" even reports similar vessels based on those of New York City were sailed on the Seine between about 1870 and 1890, with others reported in England and Germany [3]

The heyday of sandbagger racing was about 1884. At this time owners and crew came from all classes of society. Some sandbaggers were owned by wealthy yachtsmen and sailed by professional crews, others were owned by shares held by a number of individuals, still others continued to be owned and sailed by working watermen. NY banker and yachtsmen C. Oliver Iselin got his start in sandbaggers. He later went on to skipper two America's Cup defenses in 1893 and 1903.[4]

Length was the only classification criterion; no other measurements or complex formula was used. Designers and builders could experiment with beam, draft displacement, moveable ballast or, especially, sail area as the primary means of making the boat go faster. Boats were measured on deck; bow and stern were plumb to take maximum advantage. Sandbaggers were divided into four recognized classes: Fourth class consisted of vessels under 20 feet; Third class vessels ranged between 20-23 feet; Second Class measured 23-26 feet; First class sandbaggers like ANNIE were between 26-30 feet. A few were larger but not counted in the classes.[5] The general rule that you finished with the ballast you started with was not always observed.[6]

Sandbags varied in size and design and the number carried depended on vessel size and conditions at the time of a race. The usual range was between 25 and 40 bags weighing about 50 pound each[7]. Generally they were full of gravel not sand. Gravel drained better, keeping weight relatively consistent and helping to prevent the canvas bag from rotting.

It took a well trained and experienced crew to race these boats. The man at the tiller and the sheet men had to be true experts at their craft. Ballast handlers had to be both physically strong and quite agile. Naval architect, historian and author Charles G. Davis (1870-1959) states

[1] W.P. Stevens, *Traditions and Memories of American Yachting, Motor Boating*, Sept. 1939, p32.

[2] Joseph Gribbins, *Nautical Quarterly*, April 1979, p. 16-27.

[3] John Leather. Ashford Press Publishing, Southampton , 1988

[4] Benjamin A.G. Fuller "*Blue Collar Boat," Log of Mystic Seaport,* Vol. 48, No.2 p 34.

[5] "*The Sandbagger; A Type of Boat That Made Great Sport and Smart Sailormen"*, *Rudder*, January 1908, pg 118.

[6] W.P. Stevens, *Traditions and Memories of American Yachting, Motor Boating*, Sept. 1939, p32.

[7] Charles G. Davis, "*Cow Bay Sandbaggers,"* Copy of an article in Mystic Seaport's Registrars Office, 96.96 Box 5.

"it was acrobatic work every minute."[8] In tacking, both sandbags and crew had to be shifted with judgment and discretion. How fast to shift, how many bags and where they were placed - amidships, outboard in the cockpit, or on the rail - were among the constant variables. Keeping the main sheet from fouling the boomkin and the boom out of the water went a long way toward keeping a sandbagger on her feet.

Off the wind jibs were boomed out "wing and wing" using a "booming-out" pole, which when not in use was stowed out of the way along the bowsprit. Some skippers so guarded their reputation that rather than lose they would intentionally capsize as that was a good excuse not to have won.[9]

DESIGN AND CONSTRUCTION

Sandbaggers were for the most part built and modeled from half models, usually but not always carved by their builders. These were men who possessed an innate knowledge of performance, speed and construction driven by local conditions.

Typical proportions were as follows: beam equal to 36% of length; draft about 7% of length; greatest beam about 60 to 66% of length from the bow. Centerboards measured about 1/3 of length and were placed in the middle third of a vessel's length. They typically had a broad flat run. Load lines were hollow forward, some had slightly hollow garboards with moderate deadrise, but very shallow. The turn of the bilge was high and soft. In some cases it seemed to rise to the deck edge. This appears in the NY boat SUSIE Q, the vessel heavily drawn on in the design of the replica Sandbaggers BULL and BEAR. Vessels nearly always had a plumb stem and large outboard hung rudder. Generally there was only a slight drag to the keel and they were always tiller steered. Cockpit seats were removable for racing.[10] This was a known feature of ANNIE.

Most sandbaggers were smooth planked, but some were clinker built. Many were built with sawn framed construction using natural crooks, although some had steam bent frames, while still others were built with both sawn and bent frames. The aim was to build as light as possible but still strong enough to stand up to the punishing loads of large sail plans, large crews and the weight of sandbag ballast. Most were built without heavy knees. Boats were known to flex to an alarming extent. Those that did were considered fast and were termed "lively" or "limber".[11]

Sail plans were described as "jib and mains'l" rigs, although some cat rigged vessels were known to carry jibs when racing, especially in New Jersey waters. Masts averaged between 8 and 10 inches diameter with little taper to the gaff jaws. Iron bands were usually used to attach both running and standing gear. Usually only one wire shroud was fit per side attached to heavily fastened chain plates. Peak and throat halyard were rigged in conventional fashion usually with the hauling part to fairlead aft to the cockpit under iron hooks on deck at the mast partners. Jib sheets were fairly conventional two part affairs with bullseyes or blocks to fairlead aft to the cockpit cleats. Due to the long overhang of the main boom and boomkin main sheets were elaborate and long. The main sheet was dead ended on the boom and passed through two single blocks on two separate horses (travelers) aft and three single blocks on the boom. A snatch block was often added inboard on the boom for extra purchase when on the wind. Bobstays were often iron rod with wire bowsprit shrouds. Cockpit seats were removed for racing. A small silk "tell-tale" swiveling on a metal rig was fit to the masthead. Custom dictated each vessel carry a long streamer which would measure from the peak to the water. The winning vessel would proclaim her victory by flying this streamer from the gaff on the way home.[12]

DEMISE OF SANDBAGGER RACING

Sandbagger racing was essentially killed by racing rules. Sandbaggers made up the first fleet at the Seawanhaka Corinthian Yacht Club in 1871. But soon the club's evolving rules eliminated extremes such as shifting ballast in races and required either an owner or other club member to steer the boat. Sandbagger racing had evolved and depended on mixed crews of yachtsmen, professional watermen and hired crews and captains.[13] By 1878 rules required all crew to be amateurs. To ensure compliance, a list of names, occupations and addresses of all on board had to be furnished before the start of each race. About 1890 sandbaggers began to give way to keel boats. The Corinthian movement, boats sailed by their owners, was in full swing. In 1896 many clubs began to adopt Yacht Racing Association of Long Island Sound Rules (YRALIS), virtually ending sandbagger racing.

With their origins in the working oyster sloops of New York Bay, many sandbaggers were converted to working

[8] *Ibid*

[9] *Op. Cit.* Charles G. Davis, *Cow Bay Sandbaggers*

[10] W.P. Stevens*, "Traditions and Memories of American Yachting," Motor Boating*, Sept. 1939, p32.

[11] *Op. Cit.* Charles G. Davis, *Cow Bay Sandbaggers*

[12] *Ibid.*

[13] Benjamin A.G. Fuller, *Blue Collar Boats*, *Log of Mystic Seaport* Vol. 48, No.2 p 34.

oyster and clam boats in their latter years when racing rules and preference had driven them from the race courses.[14] Several of today's few remaining examples of sandbaggers survive due to these conversions, though ANNIE does not appear to have undergone that fate.

Debate regarding the loss of these extreme vessels lasted well into the early twentieth century. W.P. Stephens (1854-1946)[15] did not regret the demise of sandbagger racing at all. He felt it had retarded American yacht design and development. Thomas Fleming Day, editor of *Rudde*r magazine, took the opposite position. He bemoaned the lost of these vessels as valuable training ground where professional and amateur gained valuable experience. Overall he expressed his criticism of rules governing crew makeup with the following quote; "… we all know it is a humbug. We have barred these men out not because they are riggers, sail makers or boatbuilders, but because we are afraid to sail against them…."[16]

ANNIE

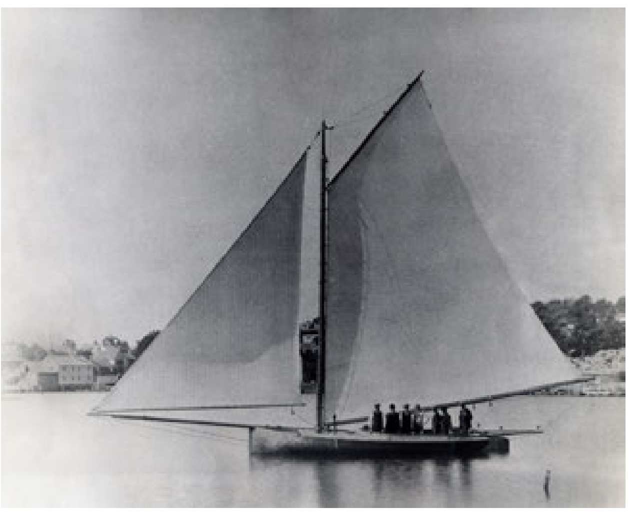

Figure 2 - ANNIE (possibly SWEATHEART) under sail in her early life. Mystic Seaport Photo Services, No. 83-4-140

Research indicates there may in fact have been two ANNIEs. Both were built for Mr. Henry Harding Tift (1841-1922) of Mystic, CT and Tifton, GA and both were built by David Oscar Richmond (1825-1908). The first reportedly built in the late 1870s and the second, which survives today, in 1880. Both were said to have been specifically built to beat the sandbagger RICHMOND, owned by T.E. Stillman.

At the time, RICHMOND was the only vessel in her class sailing in Eastern Long Island Sound. The first ANNIE proved superior to RICHMOND when going to windward, but she was about even off the wind. To further his goal Tift had Richmond build the second ANNIE. Tift is said to have owned ANNIE until his death in 1922 at the age of 83.

David Oscar Richmond was born in Mystic, CT in 1825. By about 1843 he had begun his career as a ship carpenter working for Charles H. Mallory, eventually spending nearly 20 years as superintendent or foreman of Mallory's Yard. Richmond built a reputation as a fine boat and yacht builder, and before the Civil War established a yard on Mallory property located on the east (Stonington) side of the Mystic River above the Route 1 Highway Bridge. Richmond's yard was the principal supplier of small craft for the shipyards surrounding Mystic, building ships boats, whale boats and small craft for the fishing industry. He was most recognized for his skill as a builder of yachts. In 1868 he moved his shop across to the west (Groton) side of the river to a site between the Route 1 Highway Bridge and the Amtrak Railroad Bridge. This is the site where ANNIE was built in 1880. The yard suffered a fire in 1897 which damaged ANNIE, and after another fire in 1901 she was rebuilt here once again. D.O. Richmond remained in business here until shortly before his death in 1908 when it was said of Richmond he "loved boats and his greatest pleasure was found in building them."[17]

Henry Harding Tift was born in Mystic in 1841. After graduating from the Greenwich Academy in 1859 he apprenticed as engineer aboard a steamship running between New York and the Gulf Coast. In 1870 he became general manager of a manufacturing business owned by his uncles in Albany, GA. In 1872 he purchased a large tract of pine forest adjacent to a new rail line and started a sawmill. This operation grew rapidly to include farming, live stock production and a variety of forest products including naval stores.[18] In 1888 this enterprise, by now known as Tifton, was connected to Atlanta by rail and it became a boom town. Tift's enterprise grew to include financial institutions, various agricultural activities, railroads and a "model farm"[19] known as Cycloneta. Known as "the Captain"

[14] Teusher, Phillip Thornycraft, *Sea History Magazine*, National Maritime Historical Society, Poughkeepsie, NY, No. 36, Summer 1985, p 9.

[15] William Picard Stephens. Known as the "Dean of American Yachtsmen", author, naval architect, builder, small craft specialist, an organizer of the Society of Naval Architects and Marine Engineers (SNAME) and long time editor of *Lloyd's Register of American Yachts*.

[16] Benjamin A.G. Fuller, "*Blue Collar Boats*," *Log of Mystic Seaport,* Vol. 48, No.2 p 34.

[17] William N. Peterson, *Mystic Built* (Mystic, CT: Mystic Seaport Museum, 1989), p 68-72.

[18] Naval Stores – Term applied to the collective commodities produced mainly from pine trees used in the maintenance of ships. Included are turpentine, rosin, pine tar.

[19] Model Farm – In the 19th century an international movement initiated to improve agriculture manifest in the creation of

from his early seafaring days and his continued interest in sailing, Tift was engaged in all aspects of civic life. Tift is remembered as a captain of industry and philanthropist contributing greatly to the development of South Georgia. Today his home in Tifton is preserved as the centerpiece of a museum known as Agrirama, Georgia's Museum of Agricultural and Living History.

In 1882 Tift sold the first ANNIE to T.A. Bond of Savannah, GA. The sale took place in Connecticut and ANNIE was shipped south on the deck of a schooner. At Savannah she was renamed MAY. There racing rules already forbade shifting ballast so she is thought to have received a shorter rig and fixed ballast. Other details about the first ANNIE are lost in time.[20]

Both vessels in their times sailed in New York, Eastern LI Sound and were sent south to Brunswick and Savannah, GA and Fernandina, FL for winter racing. There they competed against local boats and several other northern built sandbaggers: IRENE: BLUE NILE; and renowned local yacht ORILLA.

This second ANNIE proved to be very fast. Her original cost of construction was between \$5000 and \$5500. A letter from Mr. George M. Pynchon to Clifford Mallory, one of Mystic Seaport's early trustees and supporters, written in 1932 soon after the vessel came to Mystic Seaport Museum provides some details of her early sailing career. Mr. Pynchon was a Mystic native and remembered her construction and serving as crew on board. He states ANNIE was specifically built to beat the RICHMOND.

"She had the usual jib and mains'l rig, but somewhat exaggerated by a particularly long bowsprit with a decided bow to it, and the usual boom extending well over the stern (which was plumb as well as her bow) a very long gaff, sails decidedly baggy, two rows of reef points and believe me these were frequently used… ANNIE was the champion of her class frequently tried against boats of the NYYC and New Haven Yacht Club fleets."

He goes on to describe her as having "a very long and deep centerboard and steered quite hard with started sheets. She carried a strong weather helm, but this was a feature of practically all sandbaggers of her time, especially when their rails were well underwater."

ANNIE was frequently taken to New York to compete with other sandbaggers. In home waters she not only beat RICHMOND but competed often with local boats NETTLE and FROLIC from nearby Stonington.

Pynchon described Henry Tift as "a pretty good man at the stick although a bit timid when it came to a blow. This was not to be wondered at as he could not swim and always wore when racing a blue covered rubber waistcoat with a tube, for blowing it up in case he went overboard."[21]

ANNIE's racing crew usually consisted of 14 men and sometimes as many as 17. The positions were as follows: Skipper, mainsheet man, one or two jib sheet men including the second in command, a crew leader often referred to as second mate, about 10 strong "husky ballast handlers and a bilge-boy to pump".[22] As a rule of thumb most sandbaggers figured one man for every 2.5 feet of length.[23]

During her sailing career ANNIE is known to have been modified and rebuilt several times. In 1884 she received a new mast built by the firm of Sutton and Slattery in Mystic. The project was quite notable as described by the Mystic River Press, "… Mr. Sutton has just got out a new mast for Mr. Tift's ANNIE, 44 feet long, which was bored its full length – the largest stick ever bored entire in these parts." [24]

In 1886 ANNIE was back at the Richmond Yard for alteration. At this time work included reducing her beam and "straightening up her side".[25] In 1888 her mast was lengthened.

ANNIE was heavily damaged by a fire in 1897 and again 1901. Each time she underwent significant rebuilding and continued to sail in northern waters in summer and was usually shipped south to Georgia and northern Florida waters in winter.

Little is known of ANNIE's activity or fate between the death of Tift in 1922 and her acquisition by Mystic Seaport. By 1931 she had fallen into disrepair and was stored in a shed at Roger Freeman's Yard near what is now Fort Rachel Marina just north of the Railroad Bridge on the west (Groton) side of the Mystic River – not far from her site of original construction. In October of 1931 she was purchased from Mr. Freeman by Dr.

"Model Farms". These farms were intended to demonstrate and teach what today would be termed sustainable agriculture using best management practice.

[20] William C. Fleetwood, *Tidecraft* (Tybee Island, GA: WGB Marine Press, 1995), p 160.

[21] Mystic Seaport Research and Documentation Shop. Correspondence, Pynchon to Mallory, Annie File, Box 1 Folder 6.

[22] Mystic Seaport Research and Documentation Shop. Kleinsmidt Letter to Ms. Burke. Annie File, Box 1 Folder 6.

[23] Lander, F.T., "*Biography of an Old Sandbagger*," *Rudder*, April 1908, pg 291-293.

[24] William N. Peterson, *Mystic Built* (Mystic, CT: Mystic Seaport Museum, 1989), p 103.

[25] *Ibid.*

C.K. Stillman for Mystic Seaport with funds donated by Clifford Mallory expressly given for that purpose. The cost was $100. With this purchase she became the first of now well over 500 watercraft in Mystic Seaport's collection.

Figure 3 - ANNIE at D.O. Richman's Yard, Ca. 1899. Note sandbag at right. Mystic Seaport Photo Services, No. 83-4-59

ANNIE AS MUSEUM ARTIFACT

Once a vessel or any artifact for that matter becomes a part of a museum's collection it ceases to be merely an object (or vessel) and, then as now, is recognized as a representation of the material culture of a society – and so ANNIE passed into a new phase of her life. And a burdensome responsibility of stewardship passed to her preserving institution – Mystic Seaport - to maintain the historic integrity of the vessel for a long term future.

Soon after ANNIE's arrival up river to Mystic Seaport she was covered and put on display in front of the Stillman Building, a former textile mill which was the first exhibit space for the newly established Marine Historical Association (1929), as Mystic Seaport was then known.

Very little attention was paid to the old vessel; she was occasionally cleaned and painted and when a piece or part was in imminent danger of falling off it was replaced or repaired using any expedient measure with little regard for technique. She was seen by passing visitors and an occasional maritime professional – one of whom nearly seven decades later would unknowingly contribute significantly to her restoration.

In 1947 a half model was commissioned to be carved, copied from the original. Mystic Seaport now has that copy, however the original has been lost to time. By 1949 ANNIE had deteriorated to such a degree that her care-takers began an effort to ensure her future. The Museum had proposed a rebuilding effort to Mrs. Caroline Beebe Whitehouse, daughter of Henry H. Tift. Mrs. Whitehouse enthusiastically accepted the sponsorship proposal.

This first restoration regime began in December 1949. Work was performed through a contract between Thomas Boat Yard and Livery in Stonington, CT and Mystic Seaport, with cost to be underwritten by Mrs. Whitehouse. The intention was to restore her shape as much as possible, build a supporting cradle and replace only enough material to give her strength to sustain being an onshore exhibit with rig in place. Work included reframing most of both sides, sections of deadwood, sections of clamp, several planks each side, most of her deck frame, deck, cockpit sole and many other elements of her historic fabric.[26] A dispute arose over scope of work in the contract and Mystic Seaport finished the work, including her new deck and other details with the labor of others. The cost of this restoration was $4,238, nearly the cost of her original construction[27] Correspondence indicates Mrs. Whitehouse did not seem to mind the delays and cost over runs, but she did have some very specific requests regarding the work. She wanted to be sure the cockpit was painted ecru, the color she remembered as a child; she wanted the cockpit seats to be removable as they had been; and she requested the tiller be replaced with one representing the original with an eagle's head at its inboard end.[28] This last request would not be fulfilled until 2005.

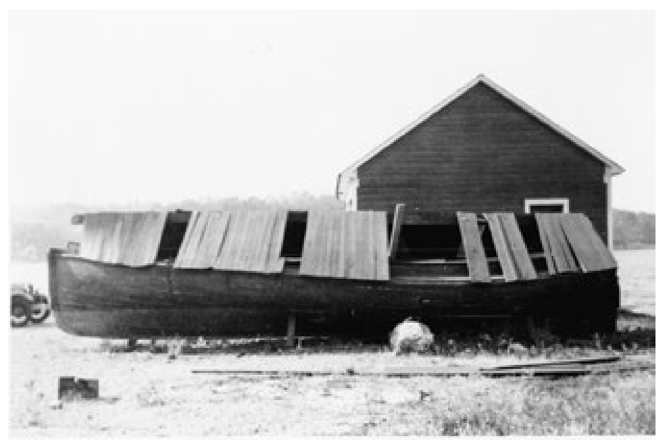

Figure 4- ANNIE, after her arrival at Mystic Seaport, 1936. Mystic Seaport Photo Services No. 50.567

Ever living up to the adage "a ship's never finished 'til she sunk" by the mid 1960s ANNIE once again needed attention. A second rebuilding effort took place in 1967.

[26] Mystic Seaport Research and Documentation Shop. ANNIE File, Box 1, Folder 6.

[27] Mystic Seaport Research and Documentation Shop. Letter Carl Cutler to Phillip Mallory, ANNIE File, Box 1, folder 6.

[28] Mystic Seaport Research and Documentation Shop. Correspondence Carl Cutler to Mrs. Whitehouse, ANNIE File, Box 1, folder 6.

Work was again performed by contract, this time between "Trade Winds Boat Shop" in Noank and Mystic Seaport. This shop was then operated by Gabriel Brancato (now the site of Avery's yard on Beebe Cove). Work included keel replacement, new clamps, stem, stem knee, stern post, a new deck frame and deck of Port Orford cedar. About 60% of her oak frames and floors were replaced. Her centerboard trunk and centerboard, cockpit sole and staving, mast step and partners were also renewed, as was all hull planking, and transom. A new bowsprit and boomkin were fabricated and spars were recycled from other vessels to represent the extreme rig she had once carried. This time however she was not to be displayed on land but afloat alongside in her natural element.

After this regime of restoration ANNIE went through a yearly cycle much like any other vessel. She was hauled in the fall, a good coat of raw linseed oil applied to her bottom and she was stored in an unheated shed with a dirt floor for the winter. In spring she was moved to the Paint Shop for a thorough sanding, followed by several coats of varnish on bright work and spars, a meticulously finished gloss black hull, bottom paint, then back in the water. After several days of swelling she was re-rigged and displayed on a mooring close to shore immediately adjacent to the Museum's entrance. ANNIE received daily attention, wash downs with fresh water, regular pumping – in short a pampered life. She was a real show piece and her extreme rig attracted a lot of attention from both aficionado and lay visitors.

Despite our best efforts, by 1996 deficiencies in earlier restorations and time caught up with ANNIE once again. We determined she would not return to the water until we could restore her yet again. Finally, in 2002 sufficient resources, skilled labor and scheduling combined to allow work to commence.

ANNIE RESTORATION - TAKE III

Facilities at Mystic Seaport's Henry B. duPont Preservation Shipyard include not only workshops, tools, lumber storage, skilled craftspeople, and all other things necessary for vessel restoration, but a dedicated Research and Documentation Shop and staff. Here is a collection of correspondence, photos, drawings, articles, publications, manuscripts, oral histories and many other items related to the history of the Museum's watercraft and related vessels. This is also the shop that documents work in progress throughout a vessel's restoration. This is where all research is begun before a new project is started.

Special attention had always been given to ANNIE, not only due to her position in the Museum's collection, but also due to the particular interest in sandbaggers held by Nancy d'Estaing, past head of the Research and Documentation Department. This was a treasure trove of information gathered painstakingly over many years.
Kevin Dwyer was selected as lead shipwright on the ANNIE project. Kevin is a meticulous craftsperson and thorough researcher. He is genuinely dedicated to discovering all that can be found regarding details of construction, then executing his work with the highest degree of accuracy and integrity. In short, he was the right man for ANNIE. The following section of this paper is excerpted and edited from his final restoration report.

When the project began it was apparent the only historic material left in the boat after two reconstructions was the centerboard trunk paneling, the center board trunk cap, the main sheet horse, and the main sheet cleat horse.

The condition problems included some troubling construction techniques used during the 1950 and 1967 reconstruction. For example, when ANNIE was rebuilt either in 1950 or 1967 she was fit with a scantling keel, rather than a plank keel, and with steam bent frames. In the 1967 reconstruction the frame heels stopped short of the keel and extremely short pieces of frame simply fastened without scarfs at the upper end or half dovetails at their lower end. In the way of the centerboard trunk the frames had deep floors but these floors could not be effectively fastened to the keel because the bedlogs extend almost to the edge of the keel. The mast step was strong enough to secure the heel of the mast for display purposes but was in no way strong enough to withstand the stresses of sailing. These and other anomalies in the way ANNIE was rebuilt had led everyone who had worked on her to question the historical accuracy and structural integrity of these earlier restorations and repairs. These questions resulted in extensive research to discover original construction details and ensure accuracy.

In a broader sense these unorthodox techniques reflect the overall philosophy of maritime preservation of their eras. Essentially, in the 1950's, if it looked about right and preserved shape a job would pass as preservation. In today's preservation world authenticity and accuracy of detail are far more important than they were in earlier generations.

As early as 1976 Brian Mogel, a boat builder on staff at Mystic Seaport, questioned some of the ANNIE's structural irregularities. Some of the problems he addressed involved the transom. In 1967 her transom was removed and replaced with new work. Fortunately the transom was in a local private collection having been salvaged from the discard pile during the rebuild. This transom had not been replaced in 1950, and therefore dated from some time prior to 1931. Drawings were made showing the substantial differences in shape between these two transoms but no attempt to restore its earlier shape was made at that time.

As extensive as the collection of material in the Shipyard's Documentation Shop is, the subtle details of a specific aspect of construction are often wanting. This was certainly true in ANNIE's case. A few photographs taken in the 1930s, when she first arrived at Mystic Seaport, and others taken during the 1950 and 1967 rebuilds provided what little evidence there was regarding her construction. It would be speculative at best to simply apply information pertaining to other sandbaggers directly to ANNIE.

During the course of this new round of research a letter written in 1931 from Charles G. Davis[29] to Clifford Mallory was discovered. In this letter Davis tells Mallory that he has just taken a set of lines from the old sandbagger ANNIE he happened to come across while visiting Mystic. However these lines drawings were not present in the files then at Dwyer's disposal.

Dwyer mentioned this fact to fellow shipwright Roger Hambidge. Hambidge told Dwyer that the Museum had recently acquired Charles G. Davis' papers. This began a new round of research which soon was to yield valuable information. Much of it related directly to ANNIE. In addition, lines drawings and sail plans for several other sandbaggers were found in this collection. Finally, near the end of the material, Dwyer found Davis' field notes in which he recorded the information collected during his visit to Mystic in 1931. This was primary documentation at its best.

An extremely fortunate set of circumstances had to be in place for this information to be found, considering it had been away from the Museum for over 60 years.

Davis' notes regarding ANNIE, while extremely helpful were limited. However, what he did record increased the information about ANNIE substantially. He noted the width of the covering board, side decks, deck planking, and the position of the mast. Deck features were recorded. The number and location of the cleats used to secure the peak and throat halyards and other running rigging element were present. The size of the cockpit, the height of the cockpit coaming, the dimensions of the cockpit seats and the fact that they were removable were also recorded. Davis listed the thickness of the centerboard, and the size and position of the centerboard trunk. This information was in some cases corroborated by other sources and from ANNIE herself.

[29] Charles G. Davis was a naval architect, author and shipyard manager during his working career. He recorded and wrote extensively on historic American small craft.

An article Davis wrote about sandbaggers was also found. It is quoted widely in this paper. In it he describes a fitting which was attached to the trailing edge of the centerboard. This fitting had "jogs in it (that) acted as a ratchet… a hinged tongue being pivoted on the aft end the centerboard case to engage the jogs."[30] Without Davis' sandbaggers article it would have been much more difficult to interpret a rendering of this detail in his field note. This is believed to be the only time this feature is mentioned or pictured in any sandbagger literature.

These field notes allowed us to compare ANNIEs as she had been rebuilt to what Davis had recorded of her in 1931. One major feature recorded by Davis' drawings showed a plank keel as opposed to the scantling keel that appeared in the rebuilds in 1950 and 1967. In addition, Davis showed the keel to be 10 inches wide in the way of the centerboard trunk rather than the 8-inch wide keel she was fit with as we found her. The 10-inch keel allowed for reasonably sized bedlogs, and provided enough landing for frame heels to be fastened to the keel in way of the centerboard trunk.

Figure 5 - ANNIE with deck off ready to receive her new plank keel, shown at the right. Photo Kane Borden, Mystic Seaport

The plan of work was to create a "new" fair set of lines, and a construction plan combining all available information: earlier research, Davis' information and evidence as found in the vessel itself. Once this work was done a set of molds based on these lines would be constructed. A new stem, keel, deadwood, and transom would be built and installed in the vessel. Once this was accomplished the molds would be placed on the new keel and the old planking drawn in to them. This would describe ANNIE's new shape and the old planks would then serve as ribbands for reframing. Once the reframing was complete we could proceed as if we were

[30] Davis, Charles, "*Cow Bay Sandbaggers*". Copy of an article in Mystic Seaport's Registrars Office 96.96 Box 5.

constructing a new boat. As referred to earlier, Davis' field notes, sketches and measurements were to contribute significantly to ANNIE's restoration nearly seven decades after they were recorded.

Before beginning the restoration an EDM[31] was used to record ANNIE's extant shape quickly and accurately.

Two additional sources of information aided in the creation of her "new" lines: the 1931 era transom and historic photographs which could be used to develop a stem profile.

Using all the available information, Roger Hambidge developed the "new" lines drawing and a construction plan using AutoCAD. He began by developing a new stem profile from photographs. Next he made measurements of the old transom and transferred this information and other details from Davis' notes. He then faired the long lines and the sections to reflect these changes.

Despite this research, several questions remained. One significant concern was the choice between sawn or bent frames. It was still unknown as to which had been used in her original construction. As described earlier both types of frames were known to have been used, usually determined by builder preference or local custom. A builder of D.O. Richmond's caliber was capable of building using either type of frame. After much discussion it was finally decided to use sawn frames. There was some photographic evidence supporting this decision. Images of the debris piles during earlier rebuilds showed what seemed to be remnants of sawn frames. This and basic intuition guided the decision.

With research and drawing nearing completion we now were faced with a serious philosophical question. Was ANNIE to remain a static exhibit as she had been since 1967 or should we go all the way and make her capable of sailing once again? After considerable debate the decision was made to return ANNIE to sailing condition.

Once this decision was reached, we proceeded using the best available information from all sources. When this failed to provide answers we fell back on what might be termed "accepted boat building practice."
At the completion of work, only slightly less historic fabric continued in the vessel than when we began.

[31] An EDM works by recording a vertical and horizontal angle and then using a near infrared beam to determine the distance to a target. The position of a point in space can be determined from this information. The position of the point is then stored in the machine. Once enough points are collected the information is downloaded into a computer, and printed out using naval architectural software producing an accurate drawing of the vessel being measured.

Figure 6 - ANNIE in Frame. Photo Kane Borden, Mystic Seaport

The goal was to return ANNIE to a state where she was structurally sound enough to sail and as historically accurate as possible. The extent of the modifications made to ANNIE before she came into the Museum's possession is unknown. Changes made after coming to the Museum were poorly recorded at best. The early center board trunk cap, the main sheet traveler, and the main sheet cleat horse were reinstalled. The fragile nature of her centerboard trunk paneling required replication, and the original was stored away in archival conditions at Mystic Seaport's Collections Research Center.

By combining all available resources and the intuitive knowledge of experienced craftspeople, this restoration was able to produce a credible result that better represents ANNIE as she likely was in her last days of sail, closer to the truth of ANNIE than any of us of this generation have previously known.

IS SHE STILL ANNIE?

All wooden vessels by their nature require nearly continuous replacement of fabric over time. This characteristic is so profound that the question must be asked "is she still the same vessel after all her historic fabric has been renewed?" From the writing of Plutarch (46AD-120AD)[32] in ancient Greece to author Allan Villiers and most recently articles in *WoodenBoat* magazine this topic has been hotly debated. Historically, wooden vessels have been used as metaphor for the paradox of continuity through change.

Plutarch wrote of Theseus' Ship: "The ship where in Theseus and the youth of Athens returned from Crete had thirty oars, and was preserved by the Athenians

[32] Plutarch (46AD-120AD). Author, historian and philosopher of Ancient Greece.

down even to the time of Demetrius Phalereus, for they took away the old planks as they decayed, putting in new stronger timber in their place, insomuch that this ship became a standing example among philosophers for the logical question of things that grow, one side holding that the ship remained the same and the other contending that it was not the same." This is estimated to have been a 300 year period. [33]

The premise is that in all living organisms and some organic objects, like wooden vessels, identity is based on a "spatio/temporal continuum"[34]. Identity is maintained despite gradual change in material over time.

This question of a vessel's continued identity has even been the subject of several court cases in the 19th and 20th centuries. Federal Court findings support a vessel's continuity despite renewal of materials, holding "a ship is always the same ship, although the materials of which it was composed… may in the course of time be entirely changed"[35]

These perspectives support a view that a vessel is defined more by its form than by its material. A vessel's historic integrity is not solely in its parts, but in the relationship among them. When all the fabric in a vessel is eventually exchanged for new, is the vessel still the same vessel? Essentially, by these references the answer is yes. If replacement of fabric is executed in-kind, and the form of a vessel is maintained during each regime of restoration, never being completely dismantled and replacement takes place over time, the weight of legal opinion, historic precedent and philosophical argument indicate that it is the same ANNIE. Something many of us felt all along.

SAILING ANNIE

Physical restoration complete, the fruition of the intended goal remained to be fulfilled –sailing a historic sandbagger. During the last phases of hull restoration research was begun on her sail plan and rig. Unfortunately ANNIE's restoration budget had run dry. As a result a new rig, sails and actual sailing might have to be postponed.

Figure 7 - ANNIE nearing completion. Photo Kane Borden, Mystic Seaport

During the project communication had opened between Mystic Seaport and the chief benefactor, builders and team leader of the reproduction sandbaggers BULL and BEAR. These vessels had been built under the auspices' of the Independence Seaport Museum in Philadelphia in 1997 and had been actively sailed each season since. While a few other repro-sandbaggers had been built, this team represented the greatest collected experience sailing these extreme vessels in this generation. They offered to share their knowledge and experience freely. Upon learning of our budgetary limitation, a rig formerly used by BULL was generously loaned to Mystic Seaport for use in ANNIE. Coincidentally, while their hulls were based on SUSIE Q, this rig approximated the dimensions needed for a viable rig for ANNIE. To help lessen the anxiety of sailing such an extreme rig an invitation was made to have Mystic Seaport crew train with BULL and BEAR. A tremendous amount of valuable knowledge was gained through this experience.

Finally, on September 21, 2005, after much preparation and several training sessions, ANNIE sailed!

The day with the lightest air forecast for the week was chosen and it could not have been more ideal. It started out light, less than 5 knots, but slowly built to 12 to 15 knots –ideal sandbagger weather - by the end of the day. These conditions gave a good representation of her sailing qualities and characteristics.

As research had indicated we sailed with a crew of 14. Responsibilities were divided as tradition had dictated: Skipper, a person for each jib sheet including second in command, a well experienced and strong sailor on the main sheet, and ten less experienced but enthusiastic people for handling ballast. One important lesson learned from the BULL and BEAR team was to use water bags instead of sand. While somewhat lighter the greatest advantage is in their neutral buoyancy. Should the vessel suffer a knock down – quite inevitable in a

[33] Howard Mansfield, *The Same Axe Twice: Restoration and Renewal in a Throwaway Age* (Hanover: University Press of New England, 2000), p46-52.
[34] Marc Cohen, *Identity, Persistence and the Ship of Theseus*. History of Ancient Philosophy, University of Washington, 2000, http://faculty.washington.edu/smcohen/320/theseus.html
[35] Erastus C. Benedict, *The Law of the American Admiralty, It's Jurisdiction and Practice*, Sixth Edition (New York: Mathew Bender and Company, 1940), p 120.

sandbagger – the ballast floats free. This lessens weight in the cockpit allowing the coaming to stay above the surface once righted, making freeing the boat of water a lot easier, and the bags are recoverable.

She tacked around in Fisher Island Sound, ANNIE's old home waters, putting her on every point of sail and drilling the crew in organization and efficiency. In truth she was somewhat less intimidating than expected. Certainly a sandbagger demands respect and constant vigilance. Much as Davis describes it is an "acrobatic" activity. While an extremely powerful rig, it is somewhat predictable (NOTE: Somewhat!). It can be likened to sailing a small performance boat on steroids. One expects to get wet, even if she stays upright and there is the ever present likelihood of a knockdown. Overall, with an alert crew, she is manageable.

After returning to the Museum many small adjustments and changes were made to the rig. When handling sail in close quarters of the river channel her main boom did hit the water and she instantly became unmanageable, nearly going over. Quick sheet handling righted her but it served as an instant reminder as to her true nature. With this experience it was decided to intentionally knock her down in quiet waters to gain experience in righting her before taking her out again. Once again a debt of gratitude was owed the BULL and BEAR team. They had provided a detailed description of the procedures they had developed over years of experience in righting such a vessel. After about 50 minutes in the water she was again upright and bailed out. This was judged to be none too bad for first timers.

Several more sails were scheduled that fall, but it wasn't long before the cold winds of October put an end to sandbagger sailing for the season. One more detail remained. Mrs. Whitehouse's request that a proper tiller with an "eagle's head" be returned to the vessel needed to be fulfilled. Once again good fortune followed ANNIE. The original tiller was found to be in a private local collection. A few phone calls later found the tiller loaned to the Museum for replication. Gary Anderson, a local independent ship carver, was contracted and did a fine job in reproducing the original, which now guides ANNIE through her new career under sail.

In both 2006 and 2007 sailing seasons ANNIE was sailed several times. As one of the most favored vessel in our vast collection, many trustees, benefactors and other friends of the Museum have been invited to join in sailing one of the most exciting traditional vessels extant. This limited sailing program has added vitality and interest in the Museum's development efforts and certainly added tremendously to the morale of our Shipyard crew. Last fall (2007) BULL and BEAR visited Mystic for two days of sailing in company with ANNIE.

Figure 8 - ANNIE in company with BULL and BEAR, Sept, 2007. Photo Kane Borden, Mystic Seaport

Quoting again the old adage "a ship's never finished 'til she's sunk" ANNIE continues to be refined. New lignum vitae shell blocks were made for her last winter (2006). In the very near future a suit of new cotton sails will be made, and beautiful Sitka spruce spar stock is in hand to finally build a more accurate set of spars.

Next summer (2008) she will be actively sailed as a tool to assist our Advancement Department in cultivating both old and new friends for the Museum. Mystic Seaport has big plans for a transformation to a more vibrant and relevant institution. ANNIE as an active sailing vessel will contribute to the sense of vitality and optimism about the Museum's future.

ACKNOWLEDGEMENTS

This work could not have been possible with the long term dedication, knowledge and skill of others: Research and Documentation staff past and present - Nancy d'Estaing, Mark Starr and Kane Borden; Shipwrights past and present - Kevin Dwyer, Roger Hambidge, Walt Ansel, Rob Whalen and others; and of course our predecessor shipwrights, curators and other caretakers who all contributed to ANNIE's long and productive life.

Also to be acknowledged are the authors and other professionals who have written so prolifically on these fascinating vessels in the recent and distant past.

A great debt of gratitude is owed the BULL and BEAR team, owner, builders and sailors lead by Henry Colie for sharing their knowledge and experience learned the hard way.

ANNIE in Fishers Island Sound, home waters once again, Photo, Kane Borden, Mystic Seaport

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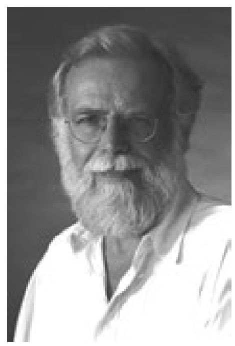
ABOUT THE AUTHOR



Quentin Snediker has supervised the construction and maintenance of, as well as captained, traditional sailing vessels for most of his 57 years. He holds a BS in Marine Transportation from SUNY Maritime College and an MA in Historic Preservation from Goucher College.

In 1988 he signed on as vessel maintenance supervisor at Mystic Seaport. Snediker was Associate Director of Programs at the Chesapeake Bay Maritime Museum where he supervised programming, the boat shop and cooperative programs for young people through other educational institutions.

In 1992 he co-authored "*Chesapeake Bay Schooners*" with Ann Jensen. He has written several articles for the *Log of Mystic Seaport*, and presented numerous lectures on Ship Preservation.

In 1995 Snediker returned to Mystic Seaport as AMISTAD Project Coordinator. He spent 36 months researching the AMISTAD Incident and supervising construction of this 140 ton vessel.

Today Snediker is Director of Mystic Seaport's Henry B. duPont Preservation Shipyard. Here a combination of seasoned professionals, apprentices and volunteers work year-round to preserve, maintain and restore the Museum's more than 500 historic vessels.

The Restoration of the New York 50 SPARTAN (HMCo#712)

By Ed McClave, MP&G; **Halsey C. Herreshoff,** Herreshoff Marine Museum; **Bill Mills** Stonington Boat Works; **Jim Elk,** Elk Spar & Boat Shop; **Bill Taylor,** Taylor & Snediker

ABSTRACT

SPARTAN is a 72 foot Herreshoff New York Fifty, one of the nine boats of this one-design class, all built during the winter of 1912-1913. (Figure 1) SPARTAN and her sisters began life as club-topsail gaff sloops; she is now believed to be the only remaining boat of the class. SPARTAN was converted to a yawl in 1945 and sailed until 1980 when hauled for a restoration that is only now progressing to completion.

INTRODUCTION

At 72 feet overall the NY 50s were some of the largest built upside down at the Herreshoff yard on a production basis. Like most Herreshoff built racing yachts they were double planked and diagonally strapped, which gave them unusual strength for their weight. The Fifties have a Universal Rule type hull: narrow with low topsides, fairly slack bilges, and a short, heavy lead keel with a ballast ratio of 50%. L. Francis Herreshoff writes that the Fifties "were of about the best material and workmanship that ever went into yachts of their size, they were so efficiently built that…they only cost approx. $17,000… in 1913".[1]

They started out as gaff-rigged sloops, and raced at a high intensity for the first two years. Besides racing as a one-design class, the Fifties won the Astor Cup for sloops nine times. In yachting editor Edwin Schoettle's *Sailing Craft* they are described as "every inch the greyhound…and excellent heavy weather boats," and also, "These greyhounds of the New York racing fleet are handled and jockeyed at close quarters like fifteen foot boats".[2] Because they required a large crew, all were later converted to schooners, yawls or Marconi sloops; and all with auxiliary power added.

The company now known as MP&G began SPARTAN's restoration in 1981. By 1988, with work progressing only on a part-time basis, SPARTAN had all new frames, planking, floor timbers, bronze hull straps, and deck beams. The project went dormant and SPARTAN sat idle until 2005 (on the lawn of the Herreshoff Marine Museum for much of that time, Figure 2). A new owner acquired her in 2005 and since September 2006 the restoration has been moving toward completion on a full-time basis.

When complete SPARTAN will be essentially a new boat, with a gaff club-topsail rig made to original specifications, her original deck layout and, except for the addition of an engine, her original interior configuration as well.

SPARTAN's hull is at MP&G in Mystic, the lead shop for the restoration, with Maynard Bray of Brooklin, ME; Elk Spar & Boat Shop of Bar Harbor, ME; Historical Arts & Casting of West Jordan, UT; R.C. Long Woodworking of Mystic CT; Mars Metal Technology of Burlington, ON; George Nicholas of Pawcatuck, CT; J. M. Reineck & Son of Hull, MA; Stonington Boat Works of Stonington, CT; Taylor & Snediker of Pawcatuck, CT; Nat Wilson Sails of East Boothbay, ME; and blacksmith Clint Wright of Noank, CT, all playing major roles. (Figure 3)

[1] L. Francis Herreshoff, *Captain Nat Herreshoff*: *The Wizard of Bristol.*

[2] Edwin Schoettle, *Sailing Craft*

The resources of the Hart Nautical Collection of the MIT Museum, through the cooperation of Kurt Hasselbalch and Frank Conahan, have also been extremely important, with more than 100 Herreshoff Manufacturing Company (HMCo) drawings being directly applicable to SPARTAN and many others used as references. These have been supplemented by MP&G's extensive project drawings based on both the original offsets and on measurements taken directly from the boat. (Figure 4)

This paper begins with a project overview and follows with papers describing the work of three of the major participants. The paper will be supplemented by a presentation at CYS 2008 where Ed McClave will update the overall status of the project supported by the authors of the following papers.

- *SPARTAN Project Overview- An Interview with Ed McClave* by Halsey C. Herreshoff
- *Hollow Spars for SPARTAN* by Bill Mills
- *Building SPARTAN's Mast* by Jim Elk
- *SPARTAN'S Hatches* by Bill Taylor

Figure 1 - NY 50 BARBARA in 1913. She was lost in 1978, running aground on Isla Margarita off the coast of Venezuela. Courtesy of Herreshoff Marine Museum.

Figure 2 - SPARTAN on the lawn at Herreshoff Marine Museum May 2005. MP&G Photo.

Figure 3 - MP&G shop being enlarged for SPARTAN Sept. 2006 hull status. MP&G Photo.

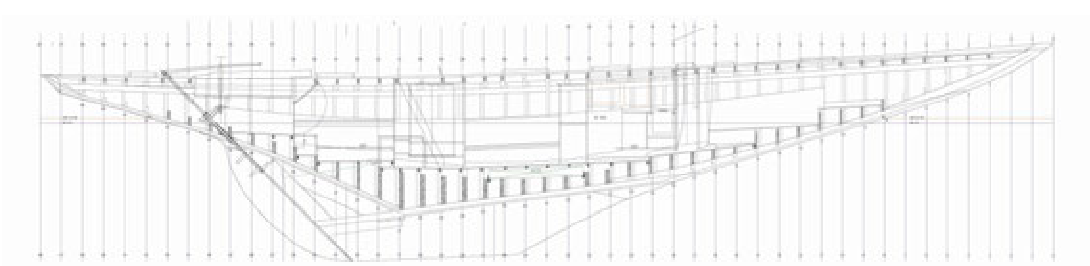


Figure 4 - MP&G profile drawing of SPARTAN.

SPARTAN Project Overview
An Interview with Ed McClave

Halsey C Herreshoff
President, Herreshoff Marine Museum
President, Herreshoff Designs, Inc.
All photos courtesy of MP&G unless otherwise noted

Obviously the Herreshoff Marine Museum is interested in the success of the grand project underway to restore the Herreshoff New York 50 SPARTAN to her original condition when built in Bristol. SPARTAN is the last remaining yacht of one of the most important of many Herreshoff one-design racing classes. The Museum has been connected with this particular yacht for a considerable time since Halsey Herreshoff sailed with owner Dr. Edward Fleming in the Caribbean in the 1970s. Subsequently, the Museum worked with successor owner Alan Pease in his attempt to restore his yacht. In 1992, this included rescue of SPARTAN from a New London boat yard by removal for preservation and viewing at the Herreshoff Marine Museum campus. Now, the Museum shares satisfaction with the current owners and the talented boat restorers conducting and administering work to return SPARTAN to her original grandeur.

This being arguably the most significant current yacht restoration in America makes particularly appropriate inclusion of the story in the Classic Yacht Symposium. Last December, Andy Giblin and Ed McClave, the partners in MP&G, visited the Museum to view several original Herreshoff yachts in the collection to refresh their understanding of subtle details of N. G. Herreshoff's design. We are always delighted to have visits by them or by other devotees of faithfulness to the original construction methods.

We took advantage of the occasion of this visit to interview Ed about SPARTAN and his personal outlook for yacht restoration. A point he continually emphasized was his admiration for Herreshoff design and construction. Having said that, he confided that the present day observation of about 100 years experience of some of the yachts racing and cruising reveal a few opportunities to improve details. Kerfing sharply steam bent frames and adding extra intermediate floors under mast steps or incorporating vertical bronze plates into the sandwich of mast step oak are examples. Ed points out that each of those practices (except the latter) were both known and used by Captain Nat, but MP&G sensibly chooses to apply them to a greater extent given the lessons of time.

Upon the Museum questioning Ed McClave about his organizational method for SPARTAN, he modestly demurred concerning the intricacies of his organizational leadership. However, further discussion made clear the fact that, like Captain Nat once did, MP&G exercises an intrinsic organizational technique including appropriate necessary lead time ordering of mast, hardware, special fastenings etc., a practice vital to good and timely completion of the SPARTAN restoration. The success of early lead time ordering is attributable both to the restorer's perceptions and to the owner's willingness to provide needed early funding. Given the highly developed and skilled departments of the Herreshoff Manufacturing Company, Captain Nat could readily obtain much of this in-house. Today, with their smaller staff and without facility for all trades, MP&G must avail themselves of talented outside shops and vendors for the same accomplishments. Thus, the mast has been built in Maine, some cabinet work is subbed out, fittings are obtained from two skilled companies, and wood procurement is more challenging than in 1912 when SPARTAN was built.

Ed and Andy seem to feel a very satisfactory comfort level with SPARTAN's owners. One element of this is the initial realistic time span allowed given the mission toward perfection and considering a shop staff of limited number. Commissioning is scheduled for mid 2009. Both Ed and Andy and the owners profit from realistic time line appreciation. Ed and Andy do not have a formal "Pert Chart", but I surmise they effectively have that in their minds given their passion for the job and their wide experience. All through the job there is constant communication, sometimes daily, with the owners, generally by phone or Email. While wisely this does not involve micromanagement from off-site, it does require detailed shared decisions on planned results; examples being choice of wood for decking and procedure to ensure an optimum keel (matters which I shall address).

While it is pointed out that this SPARTAN project is about ten times bigger than any previously undertaken by MP&G, the dimensions of the shop and availability of skilled practitioners have lead them to a limit of about six in the shop. Andy Giblin is the lead boat builder and under him are individuals of varying but significant skills. Two of them are graduates of today's boat building schools: the Landing School and IYRS; another is an "old time boat builder" experienced in wood, metal, etc. This mix plus an outstanding attitude by all toward constant learning impresses us of the certainty of a great restoration. Our previous visit had revealed a passionate spirit for exacting success and a willingness on the part of all to participate in all aspects of the work including sanding. We had been particularly impressed by the fine clamping and fastening techniques for the application of teak decking planks, work then underway.

An interesting exception to the trend to more difficult acquisition of fine wood is the SPARTAN experience for replacement of the wood keel. Originally at Herreshoff, this was made of two halves of white oak drifted together, presumably because of a limit on available wood. Quite extraordinary is the fact that MP&G located a beautiful piece of 26 inch wide oak so that the new keel is one piece. (Figure 1)

Best Herreshoff practice called for bottom planking of long leaf yellow pine, leading to a plank rabbet to transition to double planking of cypress inside and yellow pine outside or alternatively Douglas fir over cypress, the Douglas fir saving some weight and permitting a better and more constant finish to the top sides. Sheer strakes at Herreshoffs were generally white oak but the replacement sheer strakes on SPARTAN are teak, a good alternate choice.

A problem with this yacht (that was a key factor in the decision to replace all planking) was that her diagonal strapping both for the hull and the deck were steel rather than bronze; rusting of that strapping deteriorated the wood in contact with the straps. (Figure 2) Even worse was the unfortunate covering of planking with fiberglass-a practice, unless accomplished exceedingly well, apt to entrain fresh water to rot planking. The replacement strapping let into framing is all bronze. (Figure) 3 Nat Herreshoff believed that the diagonal strapping was a key element of light construction to resist racking of the hull and deck. This is vital toward minimizing motion between planks and frames that would potentially loosen fastenings. Replacement of all this strapping on SPARTAN will ensure strength as she soon enters her second century of service. (Figure 4)

Actually, this restoration of SPARTAN began preliminarily at MP&G for the previous owner in the 1980s. Though Herreshoff made deck beams sawn from white oak, MP&G then utilized available oak to produce laminated deck beams. These survived well where painted near the ends of the boat, but varnished beams in the middle of the boat suffered discoloration and surface delamination from unfortunate long exposure to the elements before a temporary deck was installed for the period of display at the Herreshoff Marine Museum. Now, the varnished beams have been replaced by new sawn beams. (Figure 4)

The original deck of SPARTAN was planked white pine, a wood available in copious quantity in 1912. However, the beauty of that decking required almost daily servicing by the paid crew. Consequently, SPARTAN's new deck is teak (about 5,000 linear feet 1¾" square). For reasons of stiffness and caulking, this same as original 1¾ inch dimension was used for the deck planking. While adding some weight this thickness will hopefully ensure a very satisfactory and tight deck. An example of MP&G's dedication to original Herreshoff practice is that they, like Captain Nat before them, ordered special screw fastenings for the deck, threaded about 50% of their overall length. This is because conventional bronze wood screws have shanks threaded 2/3 of overall length - too much for the planking thickness of SPARTAN's deck even though countersunk for bungs. Too much threading weakens screws in sheer at the faying surface and may even preclude a proper tight juncture of planking to beams; the special screws made to order have threading stopped within the top part of the deck beams.

A further word about fastenings. Mostly modern silicon bronze screws and bolts are being built into SPARTAN; none of the original fastenings will be retained. The naval brass ("Tobin Bronze") used in 1912 was somewhat less resistant to corrosion than fittings manufactured today. It is generally considered inappropriate to use much stainless steel in damp or wet wood. Though in some cases stainless steel fastenings are employed in dryer areas where corrosion is not an issue, for reasons of price, stiffness (modulus 29 rather than 15), and hardness, making the fastenings easier to drive. (Not applying at all to either the original or current SPARTAN, my father Sid Herreshoff commented to me on a number of occasions that often other builders use too small and weak fastenings too widely spaced. He felt this was often particularly true for the securing of fittings such as cleats and chocks).

Following conventional Herreshoff practice, the SPARTAN was built with yellow pine covering boards. The restored SPARTAN will have mahogany covering boards as well as mahogany toe rails. (Figures 5A & B) We spoke about the important issue of staining mahogany for a rich color that will not bleach in sunlight. In 1912, all that was available was a rather viscous orange-brown stain that to a considerable degree was like a priming paint. Today's best stains are significantly superior for filling the wood surface with a durable shade that retains the subtle wood grained appearance while providing high resistance to ultra violet rays. Many coats of Epifane varnish will be applied.

Many older boats exhibit corrosion deterioration of the upper portion of lead keels. This is partly a result of the casting process where on the top of the pour floats a lead-dross combination of less strength than the intended pure antimony–lead combination. This upper casting material is also a bit different in galvanic potential, such that over long term in salt water there is galvanic corrosion between the dross lead and the pure lead. SPARTAN's 95 year old keel exhibited this defect. Any cracks or fissures that develop are worsened by water and ice during storage. (Figure 6) Initially the owner and MP&G agreed to send the keel out for patching of the upper deteriorated keel; this involved some removal of inferior lead for replacement with purer lead plus some cosmetic fairing. Reflecting the quest for perfection, the results of this work have been rejected. The 37,000 pound lead keel will be replaced with a new lead casting. (It occurs to me that a good practice might be to cast such keels upside-down with extra material at the unstressed deep part of the keel such that the dross could be machined off after the casting solidifies).

Tall keels like that of SPARTAN are attached by hanger bolts threaded about ten inches into the lead down from floors and the wood keel. Conventional bolts available are unsuitable; this is because given the low strength of lead, ordinary thread geometry may cause sheering of the lead threads with disastrous result. Accordingly, Herreshoff produced special hanger bolts with wide spaced triangular threads for maximum holding in the lead. MP&G makes these of silicon bronze on its own lathe. This is yet another indicator of the utter dedication for optimal results for this landmark restoration project.

While MP&G is well known for its thoughtful observation of decades long failures in wood construction including older Herreshoff sailing yachts, Ed repeatedly asserted his overwhelming appreciation of the original Herreshoff design and construction. He stated that MP&G closely follow original practice in more than 90% of the cases. Having said that, MP&G do introduce differences (improvements) of significance:

1. Calculation (semi-empirical) of "spring-back" of steam bent oak frames.
2. Kerfing of tightly curving frame portions to a greater extent than did Captain Nat Herreshoff.
3. Epoxy glue in place of traditional casein or hot animal glue.
4. Epoxy scarfs in place of planking butt blocks in some, but not all cases. This, rather than being an improvement, is motivated by limited lengths of available wood and the desire not to burden the yacht with an excessive number of butt blocks.
5. Addition of intermediate frames under the mast step to enhance support. (Figure 7)
6. Replacement of the original mast step to the same overall dimension, but fabricated with a sandwich of vertical oak planks with ¼" bronze sheets. These vertical metal elements impart greater bending strength but only because the wood of the bolted "sandwich" resists wrinkling or buckling failure of the metal. (Figure 7)
7. Modern winches, but of traditional appearance. Amazingly, Herreshoff New York 50s had few winches though in today's conventional parlance, these are big boats. We need to replace "Norwegian steam" (muscle) with winch assistance.
8. Replacement of some original steel fittings with bronze to limit corrosion.
9. Weldments in place of some castings. It is agreed that this does not necessarily improve the product, but in many instances better suits today's available trades.
10. Some short cuts for mast fittings, but to retain or increase strength.

It was a distinct pleasure both to visit the improving SPARTAN with a delegation from the Herreshoff Marine Museum and particularly to interview Ed McClave and to speak with his dedicated partner Andy Giblin. The revelations herein plus those following by important venders form a totally appropriate statement for this, the Third Classic Yacht Symposium at the Herreshoff Marine Museum.

Images for Spartan Project Overview

Figure 1 – Aug. `05 – White Oak Keel Timber in MP&G Shop – to Finish 5.4" thick x 25" wide x 28' long clear of Heart and clear of Sapwood.

Figure 2 – June `07 – Crossing of Original Steel Deck Diagonal Straps.

Figure 3 – July `07 Crossing of New Bronze Deck Diagonal Straps.

Figure 4 – Apr. `07 – Deck Beams & Straps.


Figure 5A – Oct. `07 – Covering Boards finished.


Figure 5B – Oct. `07 – Covering Boards and Fwd. King Plank – Ready for Deacking.

Figure 6 – Mar. `06 – Top of Lead Ballast damaged by water and ice intrusion.

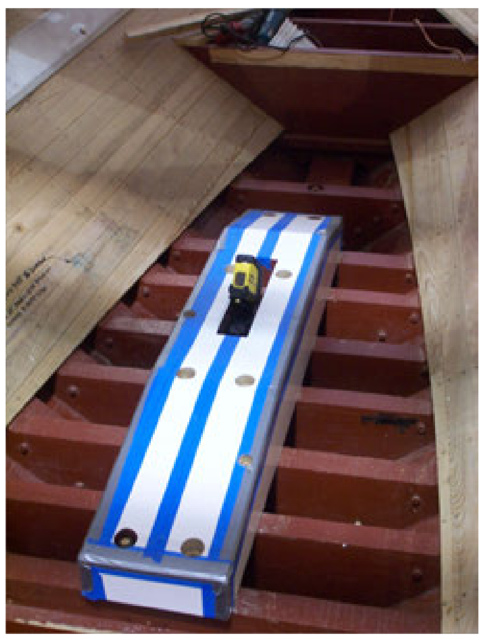


Figure 7 – June `07 – Mast Step Installed.

Hollow Spars for SPARTAN

Bill Mills
Stonington Boat Works, LLC
Photos courtesy of the author

ABSTRACT

Background of the Herreshoff Manufacturing Company's approach to building hollow spars, and methods developed by Stonington Boat Works to replicate them.

INTRODUCTION

In the spring of 2006, as Ben Philbrick and I were nearing completion of the sloop PATIENCE, Ed McClave stopped by our shop with an interesting proposition. It had become clear that SPARTAN had finally been sold, and that MP&G had been selected as the lead shop for her restoration. Ed brought with him a copy of the Herreshoff Manufacturing Company spar plans for the New York 50 footers, and asked if we would be interested in bidding for the job of building new spars for SPARTAN.

We were intrigued with the prospect, having had a long involvement with the boat during the beginnings of her rebuilding some 25 years ago. Ben was one of the crew that re-framed, re-floored and re-planked her back in the 1980s, and it was exciting for all of us to see new owners enter the picture with the desire and wherewithal to complete the transformation from museum lawn ornament to a fully found example of the finest one-design racers of the early twentieth century.

The spar plan which Ed brought presented a few challenges in interpretation, having been drawn at a time when the HMCo spar loft was cranking out spars by the mile for practically every vessel that came out of that busy works, from sailing dinghies to Cup defenders, and literally everything in between. It was an era when the time between contracting for the design of a substantial vessel and delivery of the vessel was measured in a very few months, and in quantities that are difficult for us to imagine today. Of necessity, a sort of shorthand was developed between the design and drafting staff, and the craftsmen who rendered the drawings into yachts.

BACKGROUND

Spar Plan

A copy of Herreshoff Mfg. Co. drawing 81-95 is appended to this paper (Figure 23) for reference. As is standard practice on most spar plans from any designer, different scales are used for the lengths of spars relative to the sections, in order for the drawing itself to remain of a manageable size. On this particular sheet, the lengths are drawn at ¼" = 1'0" and ½" =1'0", while the widths are drawn at 1-1/2" = 1'0". It is worth noting at this point that all of the spars for the NY50, with the exception of the jib club and boat boom, are to be hollow, built up from eight individual staves, much like a very long, slender barrel. This minimizes weight aloft, and is economical of material. The engineer likes it because there is only wood where it is necessary to carry the load applied. Cross-sectional dimensions are given for each spar at its section of greatest girth, and at each end. By extrapolation, this gives the wall thickness at these locations, which was where it started to get interesting.

Wall Thickness

The spinnaker pole is straightforward, in that the wall thickness remains a constant 1" for the length of the spar. In every other case, however, the wall thickness is greatest at or near the middle of the spar, and becomes gradually less toward the ends, putting wood where it is required for strength, and eliminating excess weight where the anticipated loads are not as great.

Standard Tapers

We suspect that Mr. Herreshoff had long ago worked out, by inspired design and destructive testing (intentional and unintentional) what he felt were the ideal relationships of cross-section to length for a particular type of spar. These are represented on the spar plan as “Taper #2, Taper #3”, and so on. This presented somewhat of a dilemma for us, not knowing what made “Taper #2” different from #3 or #4.

As part of his research for the overall project, Ed spent a considerable amount of time in MIT’s archives of the Herreshoff drawings, and could nowhere discover a drawing which spelled out the derivation of these various tapers. Fortunately, as we were mulling this over, Maynard Bray happened by on one of his infrequent visits to the area. He remembered sending Ed a duplicate of a Herreshoff drawing relating to hollow spar construction some twenty years ago, and thought it might be relevant. Ed checked back through his files, found the drawing, and brought it to us. After some study, it was determined that indeed this was the information we had been seeking. The drawing (HMCo. #81-132) was a simple graph which had a series of arcs of increasing radius equally divided by a series of radians. The arcs were designated by the standard taper numbers, and the radians represented stations at two-foot intervals. By entering the graph at the arc of the desired taper number, and squaring down from each intersection with a station radian to a horizontal baseline, the resulting vertical distance from the intersection to the baseline gives the offset required to generate the full-sized mold at each station. A sketch of the graph, simplified for clarity, appears below (Figure 1). The caption beneath the original reads ”OffSets for Hollow Spar Taper Moulds. OffSets Full Size. Spaces for 16 ft. Moulds 2 ft. Apart.” We surmise that from information in the spar plan, plus the offsets obtained from this graph, the sparbuilders would generate a master mold which they would use to set up their gluing fixture.

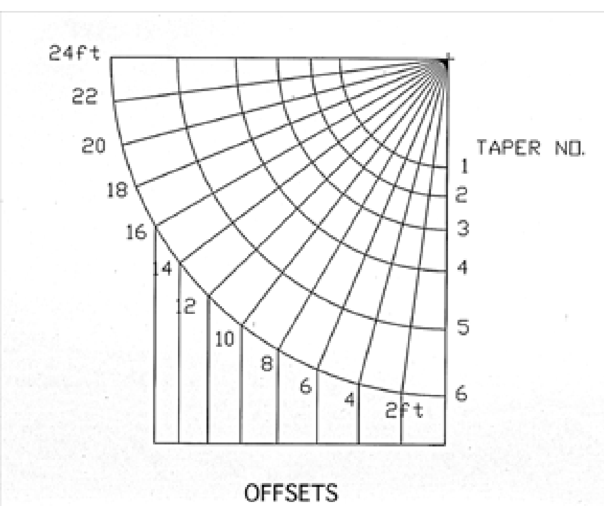


Figure 1 Sketch of Table of Offsets for Hollow Spars

CONSTRUCTION

Construction Summary

To briefly summarize the construction process of one of these spars: One needs to manufacture eight identical staves, in this case of Sitka spruce (or as HMCo referred to it, Washington spruce) of sufficient length (obtained by scarfing pieces together as necessary), tapering in both width and thickness towards their ends. The edges of these staves must be beveled to fit one another such that the eight held together edge-to-edge will form an octagon. These staves must then be held in perfect alignment as they are glued together, with the ideal being that the glue lines are invisible or nearly so. Then the resulting tapered octagonal solid must be shaped to a tapered cylinder, and coated with enough shiny varnish so that any defect in material or workmanship will be proudly displayed for all to see.

Cross-Section

In order to ensure uniformity and efficiency, we decided to make a master template for the staves of each spar. The template was generated by scaling sections from the spar drawing, fairing them at full size, then making a CAD rendering of each section at regular intervals to be used throughout the construction process.

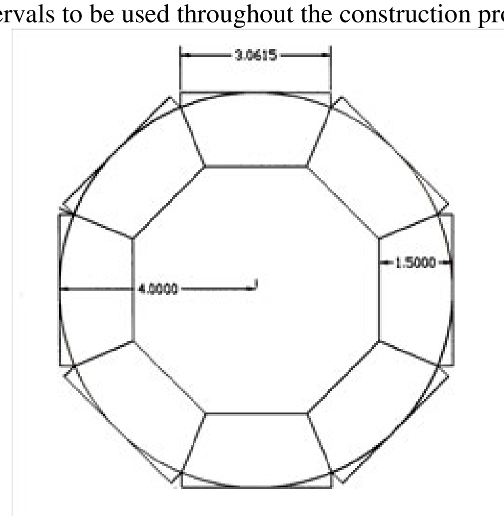


Figure 2 - Sectional view through spar.

From this sectional view (Figure 2), we can learn the following:

- The finished outside diameter, represented by the circle.
- The eight-sided figure required to yield the finished outside diameter, represented by the octagon.
- The inside diameter inscribed within the eight staves.
- The finished thickness of the stave.
- The width of the stave.

To explain the width of the stave as shown here, we need to back up a bit and look at the way that the Herreshoff Manufacturing Company’s spar shop assembled their

spars. The staves looked the same as these in cross-section, for three good reasons:
The first was economy of materials- there was no need to use a piece of wood 3-1/2" wide if ½" of that width will be planed away to reach the inscribed circle.

The second and third reasons were procedural.

Figure 3 - Spar glue-up at the Herreshoff Manufacturing Company.

There is an awful lot to be gleaned from Figure 3 about the way that the Herreshoff Manufacturing Company built their spars, some of which we'll touch on in a moment. The thing that I want to bring to your attention now is the clamp, or rather the multitude of clamps. Key to the Herreshoff system of assembling hollow spars was the Herreshoff Manufacturing Company spar clamp, made expressly for the purpose.

Figure 4 - Herreshoff spar clamp- side view.

Figure 5 - Herreshoff spar clamp-movable jaw.

Figures 4 & 5 show two views of one of these clamps, a smallish one. They were made in several sizes to suit different sizes of spars. They are a marvel of simplicity and elegance, perfectly suited to the job at hand. One jaw is fixed, one slides freely along the bar. When pressure is applied by the screw, the movable jaw rocks slightly on the bar and locks itself relative to the fixed jaw. The wide bill of the jaws distributes the clamping pressure over a large area, so as not to damage the delicate fibers of the spruce or fir staves. The cross-section of the clamping surface of the jaw was tapered to fit into the notch created by the flats on the edges of adjacent staves.

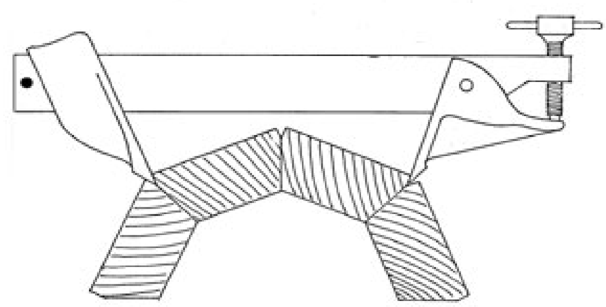


Figure 6 - Spar clamp across 2 staves.

As we said earlier, the Herreshoff Manufacturing Company was building spars by the mile, so the investment in manufacturing hundreds of these clamps (which, like almost everything else, they did in-house) was amortized in a very short time. For SPARTAN we only needed to make a few hundred feet of spars, so with some regret we chose not to make that investment in those lovely clamps.

The third reason for the notches created by the flats on the stave edges may not be apparent at first to someone who has not tried to make a cylinder from an octagon. Referring back to Figure 2 above, you will see that the apex of each of these notches represents a point on the circumference of the inscribed circle which represents the outside surface of the spar, at any point along the length of the spar. These are control points which guide the spar builder in shaping the spar.

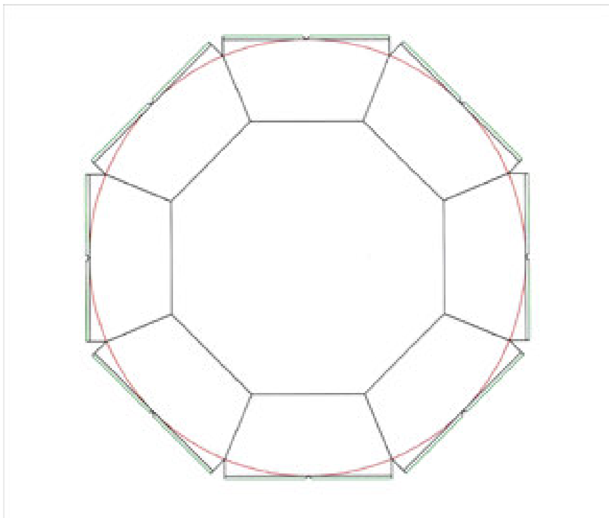


Figure 7 - Spar section as built by SBW.

Figure 7 is a sectional view of the staves as we manufactured them. The circle, as before, represents the finished outside diameter. The octagon whose faces are tangent to that circle is that which is required to yield the finished outside diameter. The additional material added to the outer octagon represents a handling allowance. The spruce, being quite soft, is easily dinged or dented, and with the several steps of our manufacturing process, we were afraid of making a mark that would remain in the finished surface. To mitigate the danger of that happening, we allowed an extra 1/16" of thickness on the outside of each stave, to be removed in the final shaping. As part of the process of tapering the thickness of each stave, which will be explained in detail shortly, we cut a groove 1/16" deep down the center of the outside face of each stave, that depth representing the thickness of the handling allowance just mentioned. These grooves, in conjunction with the apex of the notches as shown earlier, give 16 control points to plane to, anywhere along the length of the spar, which enables the rough shaping to proceed quickly and confidently.

Templates and shaping staves

Before that digression into clamps and control points, we were generating a master template for the taper in width of each stave. From the CAD rendering of each section, widths were transferred to a template blank scarfed together of Baltic birch plywood, chosen for its stability and consistency. These points, representing widths at each section, were connected with a batten and the resulting curve drawn on the template. The template was then carefully sawn and planed to the line on a simple jig which ensured a square edge on the template. While this was going on, spruce stock for the staves was rough-milled to width and thickness, and pieces scarfed together to achieve sufficient length. The template was then temporarily fastened to the inside of each stave blank, and the combination was then run first through the circular saw with a follower fence, then power-fed through the shaper. At this point, the shaper is turning a straight-sided carbide cutter with a rub collar of the same diameter as the cutterhead, which bears on the edge of the template, as shown in Figure 8.

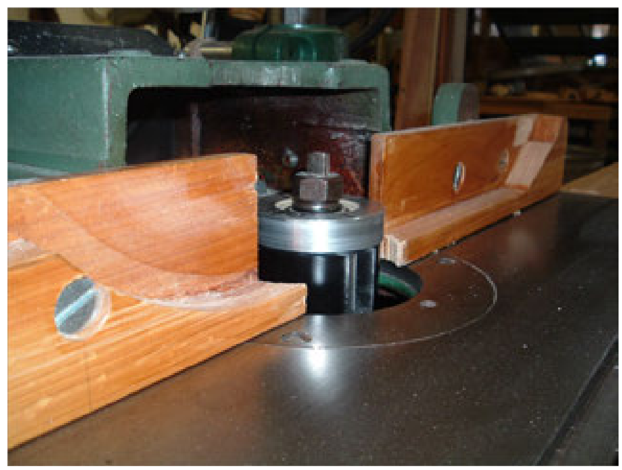


Figure 8 - Straight-sided shaper cutter with rub collar.

After repeating this process seven more times, we are left with eight identical staves, tapered in width but rectangular in section.

The template is now set aside, and the staves turned over so that the outside face is up. The shaper is set up with a special carbide cutter (Figure 9) with a 22.5° bevel, and a rub collar which is the same diameter as the small end of the beveled cutter.

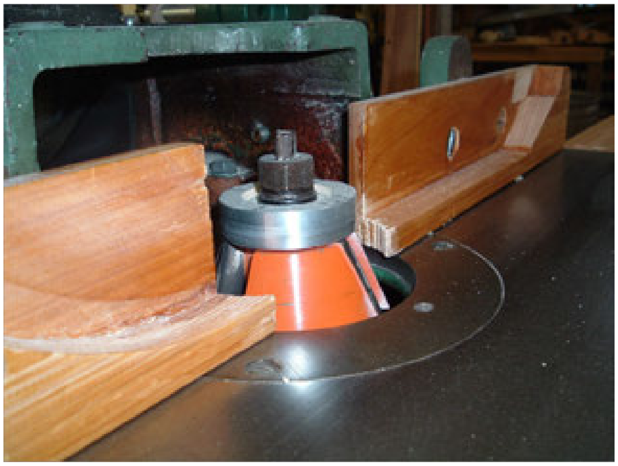


Figure 9 - Beveled shaper cutter with rub collar.

Each stave is now power-fed through the shaper, with the result that they are tapered in width, with beveled edges.

Thickness Taper

At this stage, we had to confront the issue of tapering the staves in thickness. It is helpful to note that, on the drawings for the various spars, the tapered sections were always 16 feet or less in length, with spars of lengths greater than 32 feet (topsail yard, boom) having a section of uniform diameter in the middle. As we reflected on the possible ways that the sparbuilders at Herreshoff's could have most efficiently tapered these staves, it seemed reasonable to assume that they would invest the time to make a tapered sled 16 feet long for each of the various tapers #2, #3, #4 and so on, using the mold as generated earlier from the table of offsets for hollow spars. A stave blank could be placed upon this sled, and sled and staves together could then be run through the thickness planer, with the result that the staves were thereby tapered in thickness.

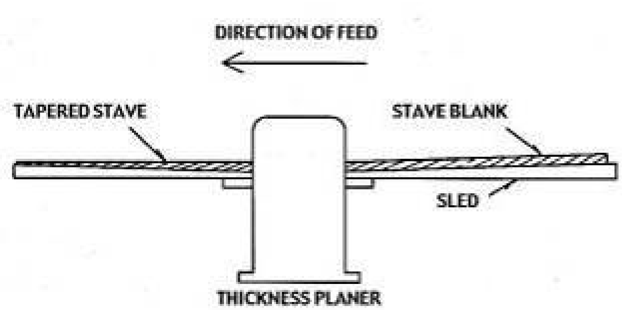


Figure - 10 Tapered sled for planing stave thickness.

In the case of SPARTAN's boom or topsail yard, the 16-foot tapered sleds for each end would be temporarily fastened to a straight board of uniform thickness, the sleds being separated by whatever distance was required to yield the straight middle section of the stave. Similarly to the Herreshoff spar clamps which we talked about earlier, the fabrication of these sleds was an investment in time and materials which made sense for the Herreshoff Manufacturing Company because of the volume of work which they had. Similarly to the clamps, we tried to develop a method which would yield a satisfactory result with less investment in infrastructure and storage space. What we arrived at is as follows:

We built a trough of straight-grained Douglas fir, longer than the longest tapered stave section, and slightly wider and deeper than the largest stave, in this case those for the main boom.

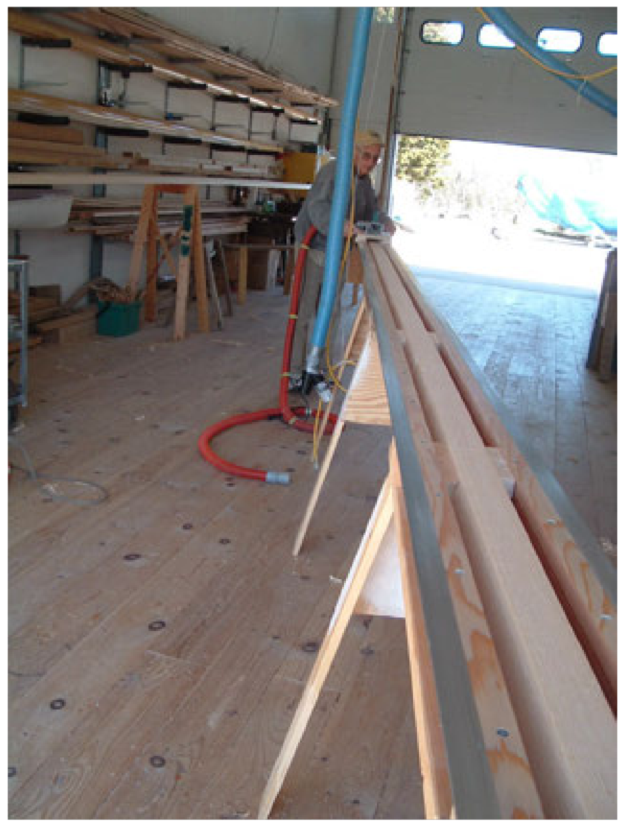


Figure 11 - Stave thickness tapering trough.

In the trough, at intervals corresponding to those used in determining the sections of the spars, we installed adjustable saddles made of aluminum bar stock. With the stave thickness information from the CAD drawings of each section, we adjust the height of the saddles such that the wood to be removed (to yield the taper at the end of the stave) is above the top surface of the trough

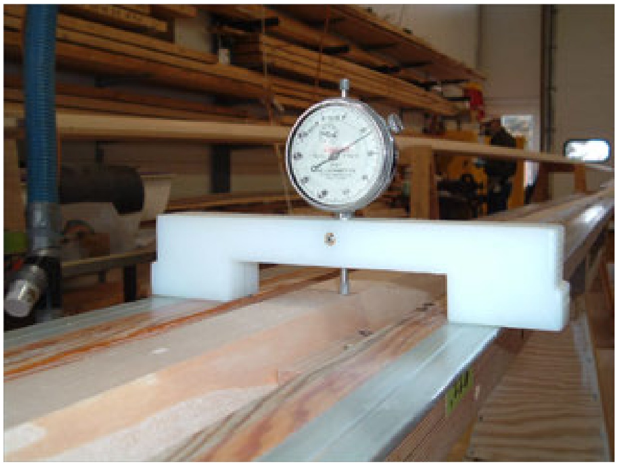


Figure 12 - Indicating stave height above trough at a station interval.

A power plane mounted on a sled, which rides along the top edges of the trough, makes short work of removing the excess. This process takes place on both the inside and outside surface of each stave, to arrive at the correct thickness inside and outside of the inscribed circle of our sectional drawing at each station.

Figure 13 - Power plane and sled on trough.

After the taper is planed on the outer face, a router on a sled, turning a veining bit set to cut 1/16" deep is run along the trough, creating the control groove for the center of the stave.

Gluing & Assembly

Now it's time to carry the staves upstairs and address the gluing. When assembling the staves, keeping the beveled faces in proper alignment with each other is of paramount importance, as is maintaining the central axis of the spar, unless of course one is building an S-boat mast. At the Herreshoff Manufacturing Company, they used adjustable metal fixtures on simple horses spaced between 4 and 6 feet apart to hold the staves in alignment while the dozens of spar clamps were put in place and tightened. You can see the fixtures in Figure 3 showing a spar being glued up, they are the long slotted arms projecting above the top of the spar half.

The fairly large spacing between fixtures and their supporting horses allowed room for the multitude of clamps, and for the multitude of men that applied them. It also allowed excess glue to drop right through to the floor and not accumulate on a bench top.

Our approach was to use the sectional drawings of the spars to generate a series of saddles to hold four staves in alignment at each station. The saddles were roughed out with circular saw and bandsaw, then CNC milled to final dimensions, ensuring perfect accuracy. Each saddle was then screwed to the spar bench on pads at each station. These pads had previously been brought to the same plane, much as one would do prior to setting up molds for building a boat upside down, Herreshoff style. Each pad had one edge on a station line, and a centerline to register with that on the saddle. Thus the centerline axis was held true in the vertical plane, and the top edge of each saddle was the central axis in the horizontal plane.

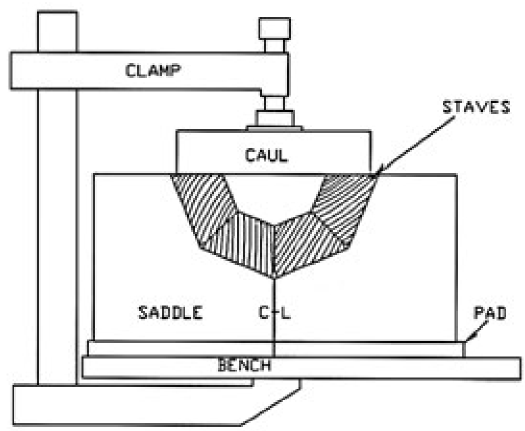


Figure 14 - Staves clamped in saddle.

Each group of four staves was dry-fit to avoid unpleasant surprises later, then epoxy adhesive was applied to all mating surfaces, and clamps were applied with softwood cauls to force the staves into alignment at each saddle. At this point the inside was coated with epoxy, and as much of the excess glue as possible was removed from the control grooves before it hardened. After a suitable length of curing time, clamps would be removed and the first half of the spar would be removed from the saddles and moved to the back of the bench. The process would then be repeated with another four staves to form the second half of the spar.

Figure 15 - Spar half glued and clamped.

End blocking was fitted and glued into each half, and then brought flush with the centerline plane. Final assembly takes place with one half still in the gluing fixture, to assure that the centerline planes remain true. Clamping pressure for this operation is supplied by stainless-steel hose clamps fairly closely spaced, and set up with a cordless drill with an adjustable-torque clutch.

Figure 16 - Spar halves assembled and clamped.

Shaping

Shaping of the spars after gluing was accomplished with power plane or drawknife, fore, jack and spar planes, taking the eight-sided spar down to the 16 control grooves. The sanding box followed, which deserves a bit of elaboration. The sanding box was made in several different sizes corresponding to the diameters of the spars being made. It is simply a long three-sided box with handles, with the inside corners eased slightly. Lengths of 9 inch wide sanding belt are stapled to each side of the box, leaving enough slack to accommodate the desired diameter of the spar. We start with 60 grit worked diagonally across and along the spar, then through 60-80-100-120-150 grit along the length of the spar.

Figure 17 - Sanding boxes for various diameters.

Figure 18 - Ben Philbrick shaping spar with spar plane.

A few half-circle templates, good light and a practiced eye attached to strong shoulders complete the job. Add hardware and many coats of shiny varnish, and they're ready to go sailing.


Figure 19 - Shaping spar with sanding box.

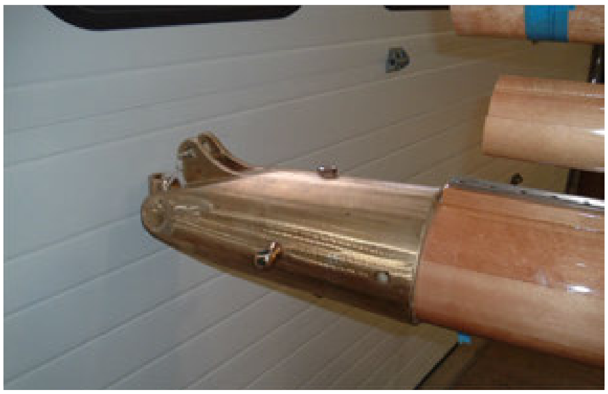


Figure 20 - Original 1912 end bell installed on new boom.


Figure 21 - Original 1912 outhaul car on new boom.


Figure 22 - New outhaul end fitting, sheave and track.

CONCLUSION

We have tried to come up with a method which allowed us to construct spars that are faithful to the original design and specifications with a modest amount of outlay in time and tooling. The reults which we were able to obtain seem to have met the initial design criteria and pleased the engineers and clients involved. We are currently using the same methods to construct spars for the three boats of the Herreshoff Buzzard's Bay 30 class which are being rebuilt by French & Webb, of Belfast, Maine.

ABOUT THE AUTHOR:

Bill Mills is a boatbuilder and proprietor of Stonington Boat Works in Stonington, Connecticut.

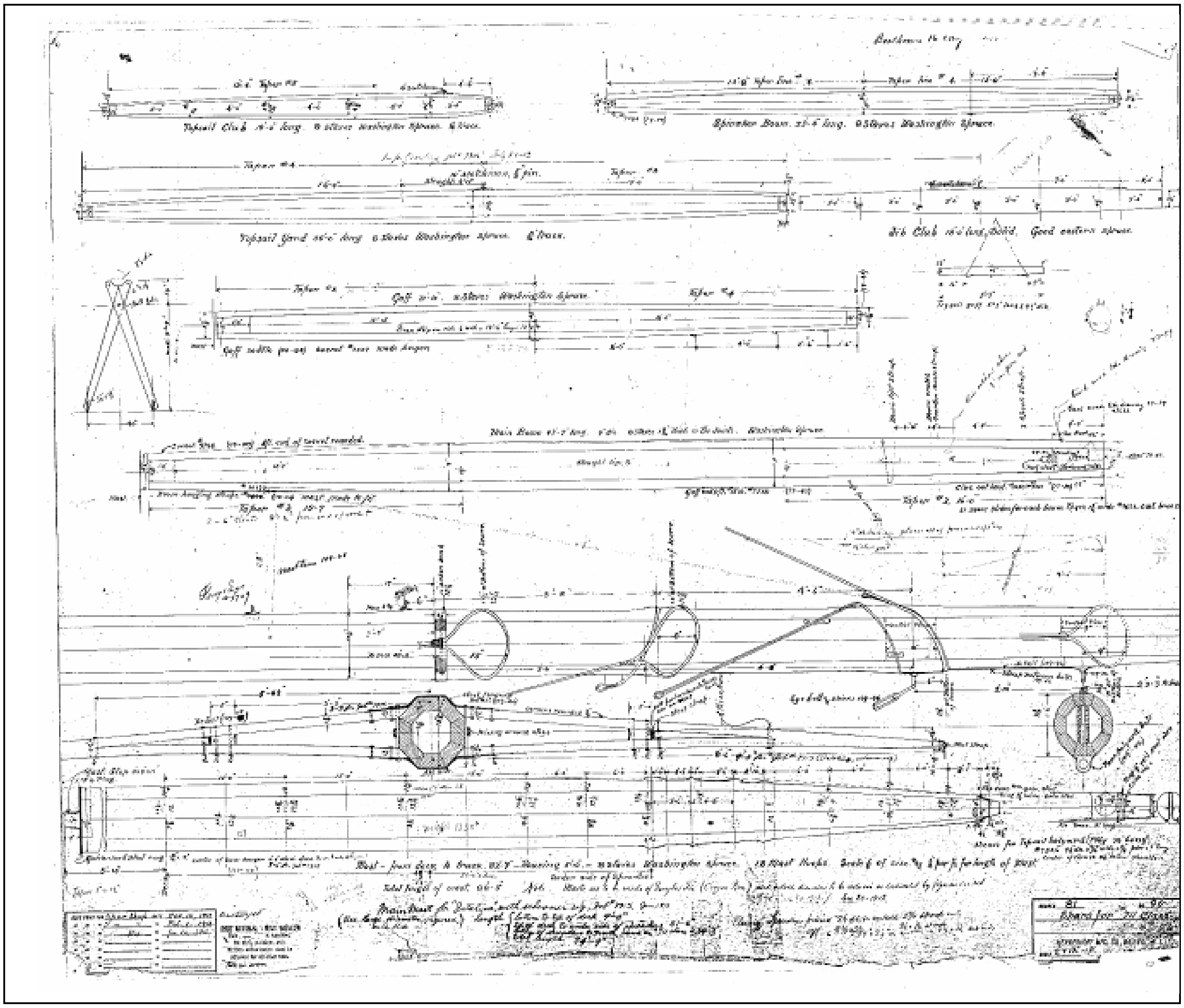


Figure 23 - Herreshoff Manufacturing Company spar plan for 711 Class (NY 50).
(Hart Nautical Collections, MIT Museum)

Building SPARTAN'S Mast

Jim Elk
Elk Spar and Boatshop
Photos courtesy of the author.

The mainmast of SPARTAN is a hollow, round mast 89'5" long, and 13" diameter at its greatest dimension. It was built from a spar plan which had drawings of several masts from more than one boat and several mast options for SPARTAN. This is a Douglas fir mast built to the designed dimensions of a Sitka Spruce mast. The construction method was the same used by the spar shop of the Herreshoff Manufacturing Co. Eight tapered staves with the edges cut at a 22 ½ degree bevel were glued together to create a hollow eight sided, tapered blank. The blank was then rounded, except for two sections of the mast that remained eight sided, the butt section up to just above the gooseneck, and the area of the mast that supported the rigging. The spar is hollow but for solid blocking at the ends and partial blocks that contain the through bolts for the peak halyards.

The mainmast for SPARTAN is the largest mast built at Elk Spar and Boatshop. Building this mast presented many challenges for me and my small crew, but in the end it became an exercise, literally, in material handling. Once the solution to the problem of moving around the pieces of a 90 foot mast in my 80 foot shop was found, creating the eight identical, tapered staves needed was a fairly easy two person job. Often during construction, I wondered how they had built these big masts in 1912, and how they built so many, so quickly. After a little bit of research into tools of the day, I think they had the power tools, table saws and shapers, to mill the staves, but I'm not sure they had the tool that allows me to succeed in accurately milling mast staves. The largest power feeder I could buy pulls the stock through the tool at a steady rate and holds it against the fence at the same time, making it possible for one person to cut and taper a 92' piece of Douglas fir nearly 3" thick. In 1912, I think that job was done by as many people as the spar shop needed from the 300 or so employees of the Herreshoff Co.

Or there is the possibility that the staves for the big masts in those days were built in sections. That was one of the decisions I had to make in planning to build SPARTAN'S mast. I had built hollow schooner masts of 80 feet and 76 feet of Sitka spruce and had milled the staves full length. SPARTAN'S staves were thicker, longer, wider, and being Douglas fir, much heavier. I wasn't sure whether the system I had been using would work. My method for building round, hollow masts is to make a pattern of the stave by taking a fraction of the designed diameter at intervals given on the plan to get the dimension of the eight-face at that point. The pattern is then screwed to the inside face of the stave blank which has been scarfed together, usually full length, and the staves are cut on the table saw which has been set to a little less than 22 ½ degrees. Once the fence is set the proper distance from the blade, with a block attached for the pattern to rub against, the stave is fed into the saw and pulled through by the power feeder, making sure the pattern is hard against the block. To make the other cut on the stave, the saw is spun around and the process is repeated. I have found by experience that the bevel from the table saw cut is not exact and so after all eight staves are cut on the saw, I pass them through a shaper with a 22 ½ degree knife to correct the bevel. This method works well as long as the wood moves easily and accurately through the tool. Previous to SPARTAN'S mast I had accomplished this by running the staves on both sides of the tool in 16' long plywood trays on sawhorses. The trays have 2" built up sides so the wood is both supported and contained by the trays. After lugging the 2 ¾ " x 6" x 30 – 40' fir around during the planing and scarfing phase of the job, I became convinced that 92' of that wood wouldn't move well on the trays. So rather than glue up the staves full length, we glued them in halves. Then due to other work I had to do, the project was put on hold for several months. During this time, I began to think about the added work of cutting 16 staves instead of 8, and the difficulty of juggling the pattern so as to get the stave fair after cutting it and beveling it in halves and then scarfing it together. It could have been done, but I decided instead to figure out how to move the staves full length. This proved to be relatively easy. We made pipe roller assemblies that the trays attached to so there was a roller every 16'. The rollers took most of the weight of the staves but the tray sides still contained them. Once this problem was solved, the staves were milled easily. The mast was dry fit and before the glue up, conduit was attached to the inside of the starboard stave for wires.

Figure 1- Detail of roller assembly between wooden tray. One finished stave is in the tray

The mast was glued together with WEST System epoxy using micro fibers as a glue thickener. The glue up was done by 10 people, a collection of employees, friends, and our children, with me mixing all the glue and everyone else spreading like mad. The assembly and clamping and clean up were done in about four hours. Rounding of the mast was done by power plane and hand plane.

Figure 2- Glue up! Also showing conduit for wiring.

Figure 3- After glue up. Mast still in clamps.

One of the most complicated parts of the job was figuring out the rigging attachments. In the original masts, grooves for the rigging eyes had been carved into the corners of the eights, and into the mast itself. Ed felt that this was inadequate and had seen evidence that additional bolsters had been added at some point in the boat's life. His solution was to glue additional wood the thickness of the served rigging, which was up to 1 1/16", all around the mast at each point of attachment. We did this while the mast was still eight sided.

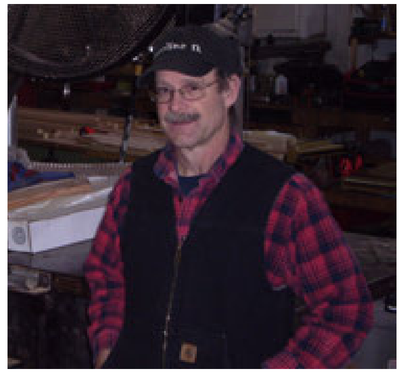
Figure 4- Continuous bolsters or cheeks around mast to support rigging.

With Nat Wilson's direction, we laid out the location of the rigging and the angle down to the deck and carved grooves into the added wood, never going into the actual wall of the mast. The grooves were carefully thought out and executed so as to give full support to the wire creating a pull around three sides of the mast that was downward and not pinching in against the mast thereby crushing the wood.


Figure 5- Close up of rigging support

Next came the difficult task of tapering and blending all of the added wood back into the original shape of the mast. After much discussion with Ed about this he offered to do it at MP&G as the rigging and hardware details were being finalized.


Figure 6- Mast on horses ready to be shipped.



ABOUT THE AUTHOR
Jim Elk repairs boats and builds spars in Bar Harbor, ME. After working at various boatyards since 1976, most notably for boatbuilder and sparmaker Jim Richardson, on the Eastern Shore of the Chesapeake Bay, Jim started Elk Spar and Boatshop in 1990, the year after he bought an old International One Design and broke the mast. After building his own mast he built eight more for the Northeast Harbor IOD fleet over the next few years. Aside from SPARTAN's mast, Elk Spar and Boatshop has built hundreds of spars from dinghy spars to large schooner spars and also spars for three historical square rig reproductions, including the two new Jamestown Plantation boats GODSPEED and DISCOVERY. He lives in the middle of Mount Desert Island, ME, with his wife Catherine, and two of their four children.

SPARTAN Hatches

Bill Taylor
Taylor & Snediker, LLC

Figure 1- SPARTAN Booby. Author photo.

When first asked to write a short piece about the building of Spartan's hatches I wondered what could really be all that interesting about building a string of elaborate mahogany boxes. After all, the plans exist and are wonderfully detailed. So maybe it's just a matter of good cabinetry skills.

Maybe the real heroes in this process are the people responsible (e.g., Jim Reineck) for duplicating the hardware: the wonderful skylight hinges, the dogs, the bronze slide for the booby, to list just a few of the parts required to make these things really work and shine.

But on reflection there are hazards that remain, despite having the plans in one hand and the skills in the other. There are aspects of this process that require attention and curiosity.

Despite drawings that seem to detail every ogee or rivet, there will be big questions. Most important of all perhaps is that none of the drawings (that I've ever seen) specify the nature of the basic joinery. They don't show, for example, how the corners of the skylight or cabin trunk are mated. Are they dove-tailed or screwed together? If dovetailed, are those dovetails through, half-blind, mitered or what?

Figure 2 – Monitor. Author Photo

This lack of information is a big deal, seeing as how the carpenter is being charged with the responsibility to reproduce and resurrect the past, *faithfully.*

Fortunately originals have survived that offer advice. In our case we had the tired hulk of SPARTAN's original monitor skylight that was helpful. We had a booby hatch from DORIS (1905)[1] that made it clear how the stiles and rails intersected (although we wondered for a while whether this might have been changed over the intervening years). There was also my experience reproducing NEITH's[2] skylights two decades ago when I had the remains of an original frame to look at and saw that the corners were mitered dovetails.

With these old objects in hand, the decision process can be guided, but the results won't necessarily be definitive. Construction details and methods changed over time at HMCo, sometimes within the course of a year.

It is also important to note that because we have these few artifacts available we can discover that the instructions provided by the drawings were not always followed to the letter. I have found on a number of occasions that this ogee here or that bead there were either reinterpreted or even neglected entirely. So it might have been that the carpenter in charge looked at a new drawing and, about some detail, may have muttered a few expletives and went his own way -- with the best interests of the company at heart I'm sure. Consequently, without an original to copy and armed only with a drawing, how do you know what exactly was built a century ago? When did one of the carpenters a hundred years ago follow his own advice and get away with it?

And finally there are inconsistencies or outright contradictions to be found in the drawings themselves. Admittedly these can be seen as minor in one context. What's the big deal if there's a bead here or not? But these questions can surely loom large in the context of the desire for *accuracy* – when you're charged with the order to do it JUST like they did it a hundred years ago.

The drawing shows two views of the booby drawn in different scales to highlight different details. In one view the molding trapping the glass is a simple quarter round; the other view shows a molding with a quirked bead. Which do you make?

Nevertheless, and this is a very important, "nevertheless," these worries, mysteries, historical gaps and inconsistencies are by no means a reason to despair.

[1] The 56 foot LWL sloop DORIS (HMCo #625) was the largest all wood sailing yacht built by Herreshoff.
[2] NEITH (HMCo #665) a 38 foot LWL one-off sloop built in 1907.

Without a time machine handy we are forced to have to think and to argue amongst ourselves and finally make a decision on the basis of evidence and experience. We hope we're doing what's right but are always willing to stand corrected. That's the fun of it: the work and the risks involved when we say, "This is a reproduction".

ABOUT THE AUTHOR:

Bill Taylor grew up on the water in Annapolis and began his career working for John Trumpy and Sons until the yard closed in the early seventies. Since his relocation to Connecticut in 1977 he continued repairing wooden boats part-time while he also pursued an academic and teaching career at The University of Connecticut. In 1988 teaching became the part-time profession when he and Dave Snediker founded Taylor and Snediker. The partnership has remained fully engaged in yacht restoration ever since.

Row Boats for the Herreshoff 560 Class

David Snediker
Taylor and Snediker LLC
Photos courtesy of author unless noted

ABSTRACT

A discussion of the approach taken for thr reproduction of three COLUMBIA model eleven and a half foot long dinghies using the Herreshoff production method.

INTRODUCTION

The opportunity to build three, eleven and a half foot Herreshoff tenders by the Herreshoff Manufacturing Company's method was the kind of job we had often hoped would present itself. Having recently completed building IMP, a traditionally built copy of HMCo #404, COQUINA, Captain Nat's boat of 1889, from Doug Hylan's and Maynard Bray's detailed plans kit, we were hoping for another small boat building opportunity. Building multiple copies of a small Herreshoff dinghy was an exciting prospect, and one we jumped at when given the chance. We built IMP by a fairly standard method where the mould represents the inside of the planking and frames are bent in after planking is complete. During her construction we frequently considered the Herreshoff method, where a more extensive mold is employed and half the boat's frames are in place before planking begins. The need for three boats, all from the same offsets, seemed to justify the investment in the more extensive Herreshoff-style building jig. The Factory Method would also, we hoped, allow for a gain in efficiency by allowing the production of multiple parts for all boats at one time where possible, not to mention the obvious increases in efficiency that comes from doing tasks a second or third time. Of course, as with anything new, the learning curve was steep at first but well worth the effort. During the course of the job we were often reminded of the old adage, 'experience is recognizing a mistake the second time you make it'.

The boats were to be built to a specification prepared by Maynard Bray, and are to serve as tenders to three of the Herreshoff 560 class boats, the Buzzards Bay Thirty footers. The offsets for the dinghies are derived from the offsets for the Columbia Lifeboat design of N.G. Herreshoff, drawn in 1899 (Figure 1). The Columbia Lifeboat offsets are for a fourteen foot boat. Wanting to produce a smaller boat of similar design, Capt. Nat reduced these offsets by 10/12ths, yielding an eleven foot six inch boat. This scaling up or down of an existing set of offsets was a common practice of Mr. Herreshoff's as illustrated by the line of boats derived from ALERION. Mr. Herreshoff also modified the boat's lines by raising the sheer height by three and three quarter inches, as indicated on plan 28-23, a design modification with far reaching implications that will be discussed further below (Figure 2). The specification also included another, slightly different scale boat from the same offset book, to be built as a tender for the NY50, SPARTAN. This boat will be built by Bill Mills of Stonington Boat Works. Thankfully, because of his involvement with both SPARTAN and the Buzzards Bay Thirty projects, Ed McClave handled the offsets, drawings, and the required research that went into producing the lines we used to build the boats. Ed provided us with beautiful full size patterns of the molds and lofted drawings of all required parts of the boat.

Two of the three boats were to have decks in the bow and stern with bulkheads beneath to form air tight flotation chambers, and be set up without center boards or sails as in drawing 28-36 (Figure 3). The third boat was specified as a sailing version of the same boat, with no flotation chambers, but with a dagger board and sailing rig, as in drawing 28-23 (Figure2). The boats were to be built lap strake, planked with Atlantic white cedar on steam bent white oak frames and to be copper riveted. Stem, keel and floors to be white oak; transoms, molded sheer strakes, thwart and bulkhead faces to be of Honduras mahogany. All boats were to be bright finished inside and out and ready for delivery early in the summer of 2008.

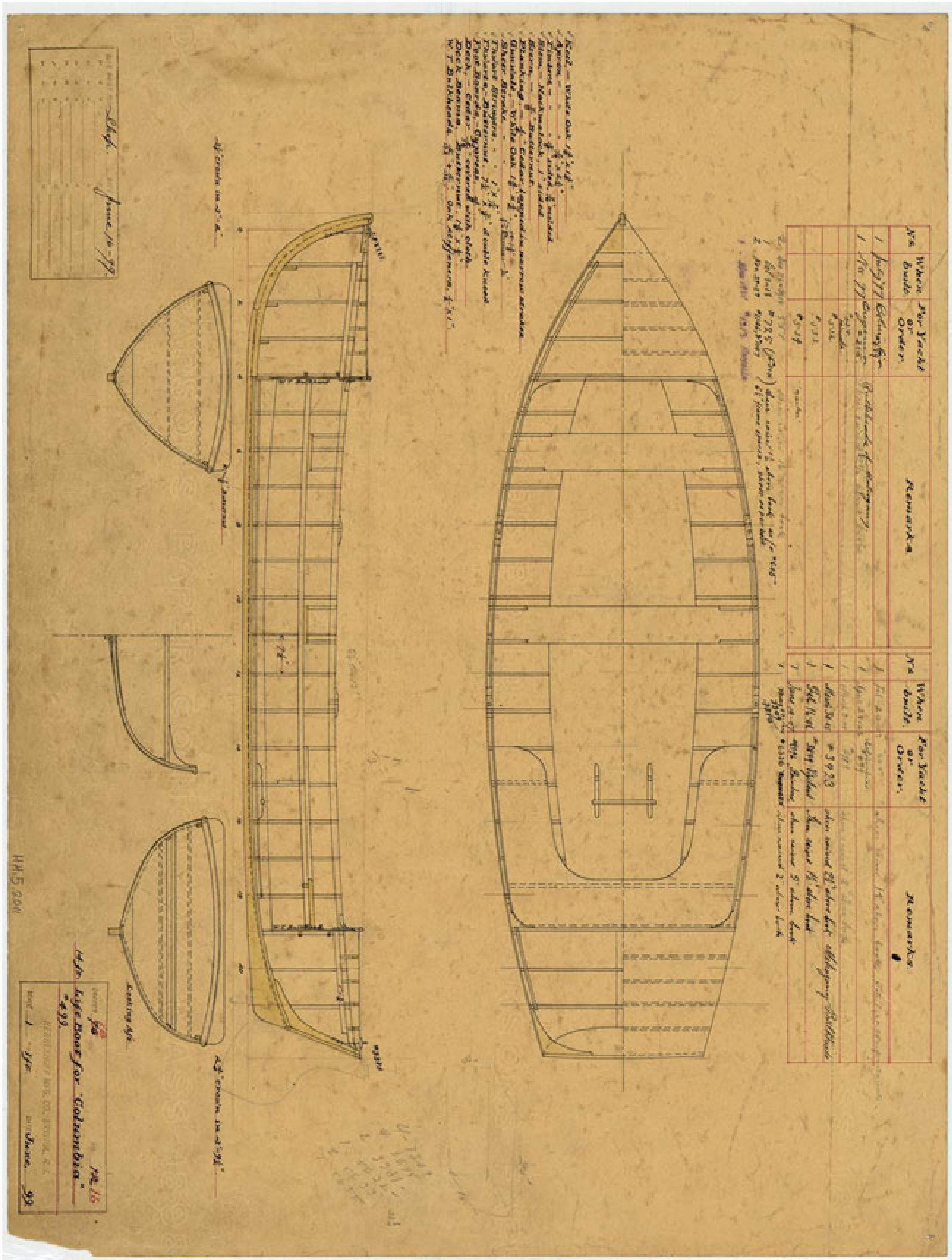


Figure 1- HMCo Drawing 28-16, 14 ft Lifeboat for COLUMBIA. June 1899. Courtesy Curator, Hart Nautical Collections, MIT Museum

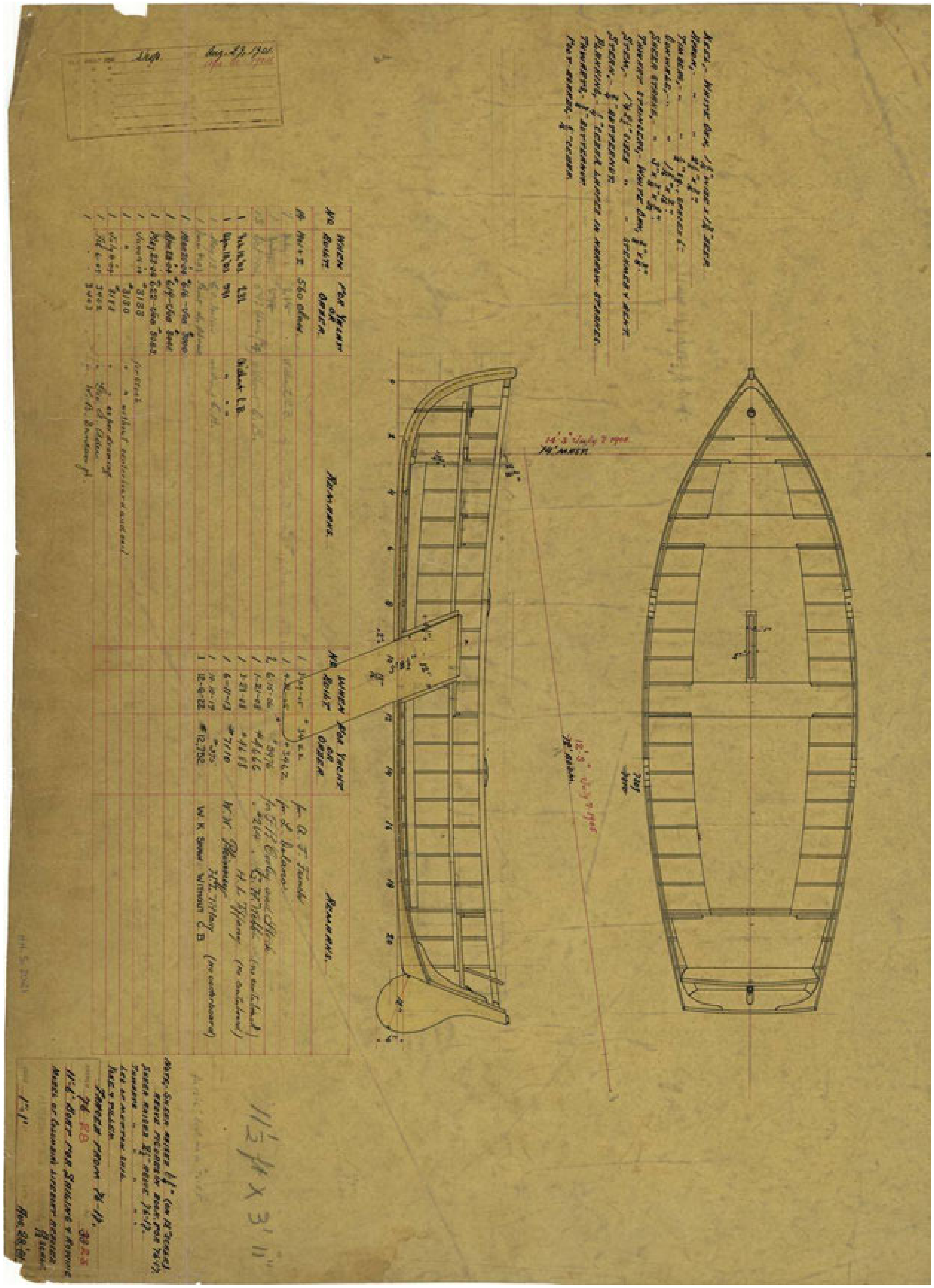


Figure 2- HMCo Drawing 28-23, 11'6" Boat for Sailing and Rowing, model of Columbia's lifeboat reduced 10/12ths. Aug. 1899. Courtesy Curator, Hart Nautical Collections, MIT Museum

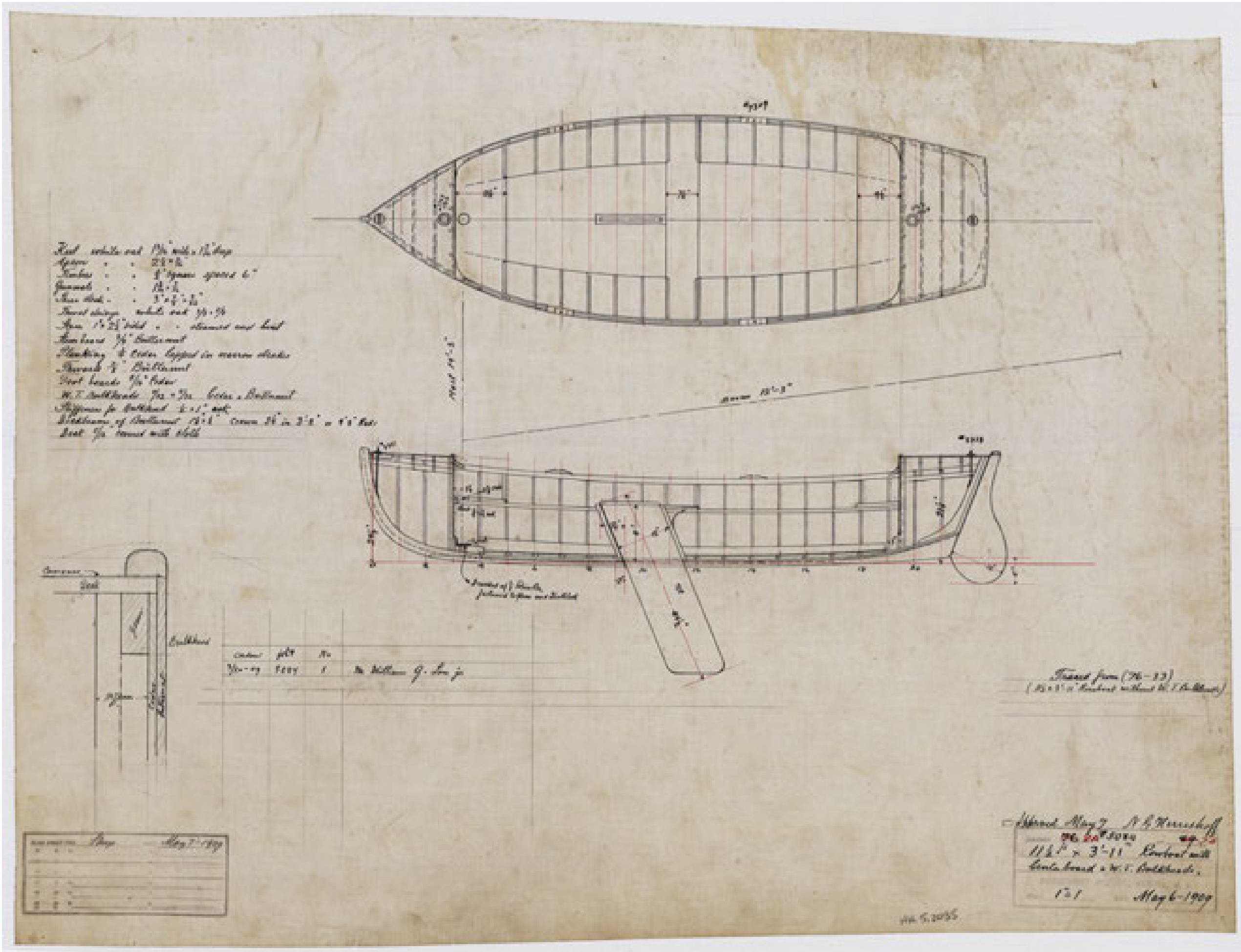


Figure 3- HMCo Drawing 28-36, 11'6" x 3'11" Rowboat with Centerboard and W.T. Bulkheads. May 1899. Courtesy Curator, Hart Nautical Collections, MIT Museum

Fortunately for us several excellent sources of information exist about these boats and the construction method used to build them. First and foremost among them are the drawings and offset book in the Hart Nautical Collection at MIT. The original half hull for design HMCo #499, a 14-foot life boat for "Columbia" also hangs on the wall of the Model Room at the Herreshoff Marine Museum and contains a wealth of information about the boat. Secondly, several historic examples of these boats exist in the collections of the Herreshoff Marine Museum, Mystic Seaport, and in a family boat, owned by IYRS head boat building instructor, Warren Barker. Warren generously loaned his boat to Bill Mills and they allowed us easy access whenever we needed to see it. The boat at Mystic Seaport is of particular significance in that it was at the center of a very thorough study, done by Barry Thomas, documenting the method used by HMCo for the production of small boats and is the subject of his excellent book, *Building the Herreshoff Dinghy; The Manufacturers Method*.[1]

As with many of the new projects we undertake at Taylor and Snediker, initial contact with a new client and the boat project itself is engaging and intriguing at first blush. However, as the project begins to unfold the really interesting aspects of it begin to reveal themselves and the boat becomes a vehicle for exploring seemingly endless webs of interconnected relationships between people, other boats, history, material culture and craftsmanship, to name just a few. This project proved to be very rich in all these aspects and more.

[1] Thomas, Barry, *Building the Herreshoff Dinghy; The Manufacturers Method,* Mystic Seaport Museum, Mystic, CT.1977.

BACKGROUND

Offsets and plans

Good documentation of the boats exists at MIT, in the Hart Nautical Collection's, Haffenreffer-Herreshoff Collection, including the original offset book of the fourteen foot boat for #499, and many pages of drawings related to the boats derived from this design (Figures 1, 2 and 3). The offsets are identified by catalog number HH.4.111.4, and the profile drawings, most relevant to the boats we built, are plans 28-23 (formerly 76-33) and 28-36 (formerly 76-89).

The offset book and the family of plans that are derived from it in the collection attest to the success of this design and reveal how it was recycled into various forms over a long span of years from its inception in 1899, to as late as 1935. Boats were built from around ten feet up to about eighteen feet in length. They were set up as lifeboats, sailing dinghies, rowboats, and even electric or gasoline powered launches. This vast array of designs were created by the proportional manipulation of the original offsets, changes in frame spacing, altered sheer heights, and changes in scantlings. These changes are noted in the offset book and on the plan sheets in very spare, almost cryptic notes, the intention of which was understood by designer and loftsman alike. For example on the plan originally numbered 76-17 (new number 28-21), dated November 24, 1899, titled "11ft-6in Rowboat", there are notes indicating the boat is a "model of lifeboat for Columbia, reduced 10/12ths". Other notes raise the sheer height and thwart placement several times, depending on the job number, with notes such as, " Sheer raised 1 ¼" (on 12" scale) above figures in book". This drawing is the first in a series drawn of the 11'6" model. On plan 76-33 (new number 28-23), our figure 2, we see that it was traced from 76-17 on August 28, 1901, and contains notes raising the sheer line to at least two different heights and showing the boat with a centerboard and sailing rig. We also find in the list shown on the plan, on the first line, the boats built for the 560 Class.

The offset book is the classic small Herreshoff notebook titled, "Columbia Lifeboat, 14' ft. boat to carry on deck of #499". At the back of the book, among the last pages, are notes dealing with various 10/12ths scale versions and the drawing numbers of the eleven foot-six boats, many with modified sheer heights. The frame spacing for the scale boats is also given here as, "6" frame space for 11.5' boat". The offsets show a series of corrections where the original pencil offsets for the sections of the boat are crossed out and an inked entry is added alongside. These changes are derived from a re-measuring of the original half hull after a lift was added, raising the sheer, and the model was re-carved in 1909. A note on the back of the model states, "Bow changed, sheer raised, re-measured Dec 4, 1909, Boats for 629 and latter". The book also contains many notes changing the scale and sheer for various jobs, both before and after the date of the re-carving, and refers to the drawings by plan number for some of the jobs.

Photo 1a- Half-hull of the COLUMBIA lifeboat with the sheer raised by adding a lift to the model. Courtesy Herreshoff Marine Museum.

Photo 1b- Notes on reverse side of the half-hull read in part, "Bow changed, sheer raised, re-measured Dec 4, 1909, Boats for 629 and later." Courtesy Herreshoff Marine Museum.

Historic Boats

Of the several historic examples of small boats in this design family, all derived from the boat for COLUMBIA, several stand out as good examples and were used as reference material for the construction of our boats. While the plans and offsets describe the shape, layout, and scantlings of the boat, they are abstract renditions of the boat and do not fully represent the object being re-created in all it's rich detail. In the course of our work on other Herreshoff boats, if given a choice, we have come to rely on original construction first. Not because the drawings are unreliable but, the drawings, as detailed as they can be, leave out much that was understood as standard work in so highly skilled a yard. Changes also probably occurred because of material availability or Capt. Nat's frequent trips around the yard. There is no substitute for the original when it comes to picking up a molding detail, figuring out what type of joint was used where, stem construction details, or finding out the dimensions of floor timbers not shown on the plan.

Herreshoff Dinghy Job # 3403, in the collection at Mystic Seaport, accession # 1974.930 is a wonderful example of one of these boats. She was built in 1905 and is one of forty-nine boats shown on the plan, built to this design between 1901 and 1922. Her job number appears on plan 28-23 (Figure 2). This boat was the subject of Barry Thomas' monograph mentioned earlier, and in terms of construction details, is the sailing version we copied for our client. She is a 10/12ths scale version with the sheer modified in height by about 3 1/2" at the bow, dropping off to somewhat less at the transom. This boat was measured by Rob Pittaway, for the Seaport, and her lines recorded. Plans are available from the Ships Plans Department at Mystic Seaport. The boat itself is in outstanding condition, being of all original construction, and is a great example of the work of the Herreshoff yard.

BILLOW II, at the Herreshoff Marine Museum (HMM), accession #92.57, is a thirteen foot-two inch scaled model of the COLUMBIA lifeboat, and is an example of the boat constructed with flotation tanks. She is in excellent condition and a stunning example of a fine yacht tender of the day. This boat was used as reference for many construction and finish details. Also in the collection of the HMM is an eleven foot six inch boat built for rowing only. Other examples of boats built to the offsets of the COLUMBIA lifeboat and scaled in different ways exist in the collections of Mystic Seaport as well as The Herreshoff Marine Museum; they illustrate the range of designs derived from the original boat of 1899.

A very nice example of one of the boat's derivations is found in the family boat of Warren Barker, of the International Yacht Restoration School, and on loan to Stonington Boat Works at the time of our project. She is a twelve-foot model, and appears to have been built at this length by a reduction of the mould spacing of the original boat for #499 to shorten the length from 14 to 12 feet, without any addition to the sheer height. (A copy of this boat was recently built by students at IYRS.) She is finished out with flotation chambers and served as our prime reference for how these were constructed. The boat is in unusable, but very original condition, and as such served as a perfect example for recording otherwise hidden details of construction. Because her decks have missing pieces we were able to see inside the flotation tanks and copy the construction method. Details and scantlings that were mysterious on the plans sheets became clear when compared to the boat as built. Because of Bill Mills' and Warren's generosity, and the proximity of Bill's shop, we were able to refer to this boat over and over again when questions arose and greatly benefited from conversations over the boat with Bill and Warren.

Photo 2- Warren Barker's boat, a 12 ft model of the COLUMBIA lifeboat, with Wade Smith recording construction details

Photo 3a - Boats being built at the Herreshoff yard 1934. Courtesy Herreshoff Marine Museum.

The Book

Barry Thomas' monograph, *Building the Herreshoff Dinghy; The Manufacturers Method* is by far the best resource available regarding the construction methods employed at the Herreshoff small boat shop. It is an indispensable piece of research based on interviews with, and the written records of Charlie Sylvester, a small boat builder and true " old fashioned mechanic", who worked at Herreshoff's for thirty-six years, from 1912 to 1940. Thankfully, Barry Thomas and Maynard Bray recognized the value of recording, from a primary source, the methods employed at the yard in this period.

The book was a part of the work of the early years of the Small Boat Shop at Mystic Seaport, and represents some of the best work done to understand and preserve the history of this segment of American culture. During the course of the oral history project with Mr. Sylvester, Barry decided that the best way to get it right was to build a reproduction of one of the boats that Charlie built while at the yard. The result is a classic of the boat building cannon, and a fine piece of literature in the growing field of material culture studies. We, and others before us, because of this work, have been able to understand and employ the Manufacturers Method, or some slightly modified version thereof, in the production of new boats. In the production of our dinghies we have relied heavily on Barry's book. As the project unfolded, hardly a week went by where we did not return to it to glean new understanding of the process. Apart from great technical accuracy, a very compelling aspect of the book is the obvious regard and respect for Charlie Sylvester that Barry conveys. We are able to develop a sense of the man, both in his time and place in history, as a craftsman, and as a part of the Herreshoff story. These are exactly the kind of connections that make this work so rewarding. During the course of the production of the book and boat, Charlie Sylvester provided hand written notes, outlining from memory in amazing detail, the process by which small boats were built at the Herreshoff yard. Maynard Bray generously provided copies of these notes to us at the start of the project; they are reproduced in the Appendix. The notes outline the process by which we built our boats very closely.

Photo 3b- Herreshoff Manufacturing Company row boat images for 1920s catalog. Courtesy Herreshoff Marine Museum

Photo 4- Ernest Alder, Charlie Sylvester, Henry Vincent, James Clarkson, and Willard Kenny with boat jig, 1913. Courtesy Herreshoff Marine Museum.

DEVELOPMENT OF LINES FROM THE OFFSETS

Before construction could begin a set of lines of the eleven foot- six inch long version of the boat, with the sheer raised by the appropriate amount, had to be produced. Our client chose to have the boat's lines produced directly from the offset book for the COLUMBIA Lifeboat, as originally done by HMCo, not from lines taken off of an existing historic boat. He also did not wish to utilize the lines plan and offsets produced by Mystic Seaport, of the boat in their collection. The job of lofting fell to Ed Mc Clave and proved to be a subtle and quite involved exercise because of the additional 3 ¾" added to the sheer heights, as noted on plan 28-23, " *sheer raised 3 ¾" (on 12" scale)*" (see Figure 2).

Offsets for the eleven foot-six inch boat with the raised sheer are not contained in any of the records available, they must be derived from the offsets for the fourteen-foot boat.

The crux of the difficulty is that on a boat, such as this, with flaring bow sections, a seemingly simple addition of sheer height has the effect of also increasing the half-breadth dimension. Because the increase in height must be carried out fair with the sectional flare, the half-breadth at the sheer increases. There is no evidence in the drawings of these boats or in the examples available that this increase in beam was allowed, as all reflect a proportional decrease of the half breadth, from the original 14' boat's offsets, by 10/12ths, to a beam of 3'11".

How Captain Nat and his loftsman, or the mold maker, overcame this difficulty remains a matter of speculation. There is no document that was found in the course of this project that shed any light on this question, other than the simple notes already discussed. All the drawings showing arrangements for the boat give a beam of 3'11", and all the historic boats consulted measured very near this dimension – so how did they do it? A fair guess seems to be that, prior to the re-carving of the half hull in 1909, to raise its sheer, the boats were built on a mold or molds that were altered on the loft floor, by men very experienced in their trade, and not much note was made of it. It was simply done by the standard method of work understood in the yard.

In order to create the set of offsets and lines we were to use, Ed tried several methods, each resulting in different hull shapes. The process Ed used is best described in his own words, as follows, with reference to the accompanying drawings of Figure 5.

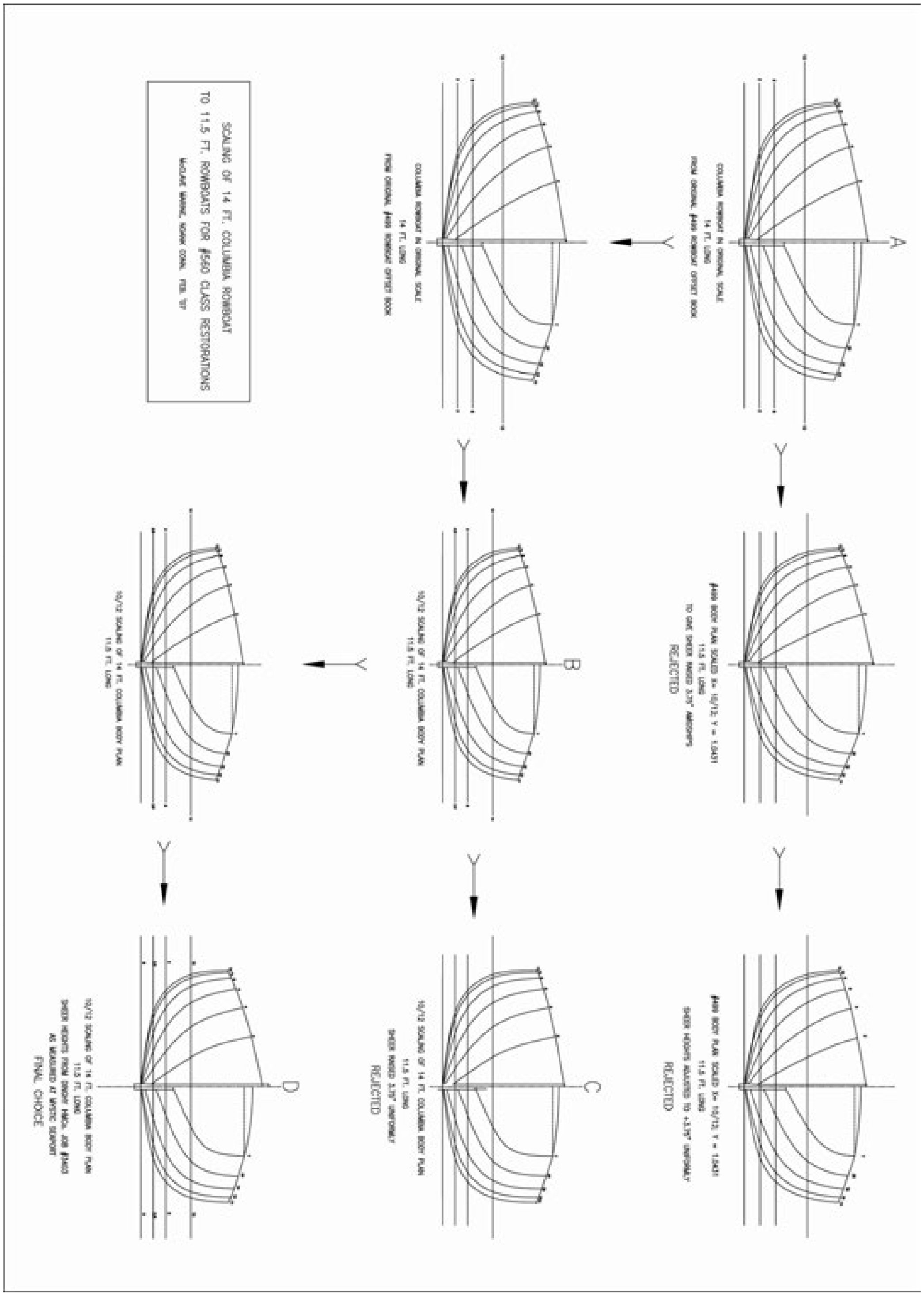


Figure 5- Drawing provided by Ed McClave showing various hull forms produced by scaling of the COLUMBIA lifeboat offsets by 10/12ths and adding sheer height.

*"I entered the offsets into AutoCAD, only fairing out a couple of major bumps in the section curves, drew in some waterlines and diagonals, then plotted these lines in quarter-scale (3"=1'-0"). I faired these lines in conventional fashion on the drafting table, had to move only a few points to get things nice and fair, and then updated the CAD drawing accordingly (*Drawing A on Figure 5*). However, scaling down to 10/12 and adding 3-3/4" to the sheer wasn't as easy as I had hoped.*

*I then took the body plan of the 14' Columbia rowboat after I faired the lines in the original scale and scaled it down to 10/12. (*Drawing B on Figure 5*) Then I set new points 3-3/4" directly above the sheer points for each frame. Following the original control points from the rabbet up to about 7-1/2" below the sheer aft, changing gradually to about 9" below the sheer forward, I drew new section lines, ending at the new, raised sheer points. I was: (1), trying not to alter the shape of the hull below any reasonable loaded waterline; (2), trying to reproduce what I felt was the most likely method the mold maker himself would have used in the same situation - developing a set of molds based on the original offsets and with the sheer raised but with the half-breadths at the sheer unaltered from the original offsets, and retaining the fairness inherent in the original offsets; (3), trying to "editorialize" the shape of the hull as little as possible. The result, as you can see (*Drawing C on Figure 5*), is a fairly burdensome, slab-sided, flat-floored ugly-looking boat.*

When compared to the lines published in Barry's book, of the boat at Mystic Seaport, which shows a somewhat finer, nicer-looking shape, it's hard to see how the boat that they measured could have been based very closely on these offsets. But the Seaport's lines correlate very well with the half breadths of my scaled hull with the raised sheer, and the boat they measured is specifically listed on Plan 28-23. (Figure 2*) Their sheer is slightly lower except at the bow, the transom is slightly less deep, and their sheer half-breadth at the widest point is about an inch greater (thus they report this boat as 4'-1" beam rather than 3'-11"). It's hard to make an exact comparison because his baseline is not coincident with (or even exactly parallel to) that of the offset book, but considering measurement and drawing errors, the difficulty of taking lines off a lap-strake hull, the fairing necessary after taking the lines, possible original construction deviations, and allowing for some change in the shape of the lightly-built hull over the years, there's no reason to suspect that it's not the same boat. (I also know that the lines produced after taking the shape of an existing boat are never worse-looking than the boat itself, and are often quite a bit better-looking). The sections the Seaport shows are somewhat finer, less flat-floored, and less slab-sided than those I derived from the offsets, all the way down to the dead rise in the mid-ship sections. It's hard to believe the guy making the molds (at Herreshoff's) would have gone down that far with the changes in section just to raise the sheer, because that would have been a re-design that would have required another round of longitudinal fairing, which in that case would have to have been done by dubbing once the molds were set up, making it very difficult to preserve side-to-side symmetry.*

Despite the differences in baselines, I lined up the Seaport's profile with mine, and found that the sheer of their boat, #3403, was coincident at the bow, but dropped down aft of that to a lower transom height. My final step was to take the sheer heights and transom depth from this boat and apply them to my scaled body plan, drawing the new sections to these points rather than to those 3-3/4" above the scaled sections. This shape defines a boat that is also a bit burdensome, but not as bad as its predecessor. This one is my best guess for the correct (but not necessarily the best-looking) shape for the BB30 boats, trying… to base the boat on the Columbia dinghy offsets, using the boat at Mystic Seaport as reference." (Drawing D on Figure 5)

With the design offsets and lines now complete, Ed provided the mold sections for every-other frame, the stem profile and rabbet sections, the transom, and the keel profile, to us as full-scale computer generated Mylar sheets. With our lofting in hand it was time to start the building process.

BUILDING PROCESS

We chose to build these boats by the Manufacturers Method as described by Charlie Sylvester, and as laid out in Barry's book. However, because we are boat builders, we share that affliction common to all our ilk - we really can't do anything the way someone else tells us to. So we poured over the book and the notes from Charlie, and debated the way forward over a lot of coffee and tennis ball throwing with the dogs, and decided on our own, slight modifications to suit our needs and shop.

The Herreshoff method was developed by Nat Herreshoff and the family in Bristol during the early years of his career, and was noted by W.P. Stephens.

" In planning GLEAM, Nat adopted an original method of construction, a solid mould of two thicknesses of one-inch pine board was made for

> every frame spaced about one foot apart. The two members of the frame were steamed and bent on the mould and held by dogs, their heels being united by a floor. With these moulds set up solidly on the keel, the planking was done more rapidly and more accurately than by the conventional method of frames bent to skeleton moulds and ribbands. (L)ater this method was reversed, the moulds being made with the top edge as the baseline and set up directly on the floor, upside down, the keel being laid on top of the moulds."

One key feature of the system is that it starts with offsets given on stations that correspond to the boat's frame spacing. The boat's lines are laid down on the floor, (or in virtual, digital, space), and moulds are made at these frame stations. The lofted frame station is reduced in size by subtracting the planking and frame thickness. The mould is then built to this shape and these are then set up, upside down, on the floor, in sequence at the required spacing. Frames are then bent over the moulds and a floor timber is attached across their heels. With their frames and floors in place, the backbone, assembled on the bench, is then put in place. Planking then proceeds from the garboard to the sheer. The hull is then removed from the jig and set upright for installation of the rest of the frames and other interior details.

We did not have to loft the boat, or draw it to full size, because Ed provided us with a full scale drawing of the lines. The lofting of the body plan we received had a station for every other frame, showing all the even numbered frames. Each station showed three lines, representing the outside of the hull, the inside of the planking and the inside of the frame. By transferring the shape for the inside of the frame to our mould building stock, we built a mould for each of these stations. The moulds were built with a board across the top, at a building base or waterline set above the sheer, so that when set up relative to each other at the required spacing, they represented the shape of the inside of the frames of the boat.


Photo 5- Joel Plessala building moulds.

We built our jig of pine and modified the set up from the Manufacturers Method by setting our moulds on top of a standard ladder frame. The ladder is simply a frame of lumber, longer than the boat is long, with cross members attached that have one of their faces corresponding to the frame or mould spacing of the lofting. The moulds are screwed directly to these to recreating the designed frame space. We chose to go this way because of a rough concrete floor in the shop where the boats were built, this method allowed easier attachment of the moulds and easier leveling. We thought it would also have the advantage of allowing for height adjustments of the jig during the building process, practically speaking though, once set up, we never moved the jig. The moulds were aligned so that, forward of center, the aft face represents the station from the plans, and vise-versa aft of center. We then faired the mold with battens, by beveling away only the wood fore or aft of the face of the mold designated as the station. In this way the mould edges were beveled the proper amount so the frames, when applied to this edge, would twist to the proper bevel.


Photo 6- The assembled jig with frames and floors installed.

We began the construction process by first making the stems for all three boats. The stems are steam-bent white oak, made of two pieces that come together approximately along the apex line of the rabbet. Barry Thomas reports in his book that Charlie Sylvester built the stems for the boats he constructed of one piece. All the historic boats we examined however showed that the stems were built up of two pieces. Since bending smaller pieces of wood requires less force, and is better for the timber from an engineering perspective, we went with two-piece stems. The pieces measure 1 3/8" square and were bent over a form, using a compression strap. The pieces were steamed for about two hours, removed from the steam box and set on the form; the bend was then made with the use of a come-along and the stem clamped up tight with large clamps. After cooling the stems were removed from the form and a stay lath was applied at the ends of the overlong blanks to keep the shape from changing. The two-piece nature of the stem made cutting the rabbet a bit easier, allowing us to clean up the cut with the pieces separated. The two pieces were then joined together with nine pound cut shellac (nine pounds of shellac flake dissolved in one gallon of alcohol) between the layers and screwed together with bronze woodscrews, set from inside, as seen in the other boats.

Photo 7- A two-piece, steam-bent, white oak stem clamped to the bending form.

While the stems were being made we also made transoms, transom knees, keel aprons, and keels, all at the same time, to take advantage of the efficiency of making multiple parts. With these back-bone pieces made, an assembly consisting of a stem, keel, keel apron, transom knee and transom was assembled on the bench. This assembly was then ready to be installed on the building jig after frames and floors were applied to it.

The frames for these boats are small pieces of wood, only 1/2" square and about 36" long at the longest. We made all we would need in one round of milling from some beautiful, green, white oak. The frames were steamed for about one half-hour and bent directly onto the set up moulds for the boat. At Herreshoff's they used a type of dog, described in Barry's book that was custom made at the yard, to hold the frames to the mold. We used a combination of nylon wire ties passed around the frame and through a small hole drilled in the mold, and, "L" shaped wooden clamp blocks, screwed to the mold to hold the frames in place. The hot frame was offered up to the mould; the heel (at the keel) clamped in place and the frame then bent down around the mould edge. Frames were left long so that a screw could be run through them into the mould above the sheer mark on the jig, to hold them in place. Very little clamping was needed to twist the frame down to the mould, this was accomplished with one or two wire ties or blocks. With the frames all bent in place, floor timbers of 5/8" thick by 1 1/8" tall, seasoned white oak were fit to the frame heels. Because of the twist in the frames, particularly in the ends of the boat, the faying surface of the frames was flattened to fit the floors. The floors were then riveted to the frame heels.

With the floor timbers and frames in place the keel assembly was set on top of the jig and the frame heels and floors were fit to it. All was then fastened together by screwing the floors to the keel. The rabbet was checked and tuned up with battens and the fit of the planking checked with a small sample of planking stock. The bevel of the back rabbet, formed by the keel apron, was adjusted for final fit. With the frames and floors in place, and the backbone assembly installed and faired, the process of planking could begin.

Photo 8- Scott Gifford fitting the keel assembly to the already installed floors and frames.

The boats are planked with ¼" thick Atlantic white cedar. By picking through piles of live edged, flitch sawn, 1" lumber, we were able to come up with enough clear boards to plank the boats. Our boat, because of the hard turn of the bilge, and scant dead rise, required eleven strakes of planking per side. Ten of these are of cedar, while the sheer strakes are made of Honduras mahogany. After a careful lining off to determine the run and width of the planks, the planking of the boat begins with the garboard. We picked up the shape of the garboard by spiling in the usual manner with a compass and a spiling batten. We used this method for picking up all the plank shapes as planking proceeded, choosing not to follow the method Charlie Sylvester used at

Herreshoff's, and shown in Barry's book. Because our boats were to be bright finished throughout we felt the nails involved in the other method might mar our planking. The plank shape was laid out from the spiling, onto 7/8" thick plank stock and the shape sawed out. This double thick plank was then trued up with a hand plane and split vertically on our re-saw band saw, producing two book matched planks - mirror images- for each side of the boat. The fit of each of the planks was checked on the building jig, and if the plank laid onto the marks properly the shape was traced onto ½" thick plywood and a pattern made, so that the shape would be available for producing the planks for the next boats. This pattern reproduction of planks is made possible by the Herreshoff jig, since the shape of the boat is controlled very exactly, it is a simple matter to ensure that the next boat would require the same shape planks. Because of this certainty, it is possible and desirable to mass-produce planks from patterns. Planks for our second and third boats were made by tacking the patterns to selected 7/8" thick planking stock with small dabs of hot melt glue. The plank was then sawed out close to the pattern on a band saw and then passed over a shaper with a cutter set up with a pattern following bearing. The resulting plank stave is exactly the shape of the plank pattern with clean, square edges. These staves were then re-sawn and the two resulting planks finish planed to ¼" thickness.

Photo 9 - The set-up we used to produce planks from patterns. The ½"plywood plank pattern is shown resting on top of a piece of 7/8" thick Atlantic white cedar planking stock. The shaper cutter behind the plank shows the pattern following bearing above the cutter. A Herreshoff design #404, COQUINA, under construction in the background.

The planks, as in all lap strake construction, are beveled along their edges where they lap each other. We applied this bevel with a small router, mounted in an angled base with a fence attached. The router method is fast, and produces exactly repeatable results every time, insuring uniformity and speed over other methods.

Gains were cut in the ends of the planks where they are let into each other at the hood ends to lie smooth on the transom and in the stem rabbet. These were cut by hand and adjusted to fit on the boat. With the gains and the bevels cut, the plank was clamped in place and attached to the frames with small brass escutcheon pins, driven through the top lap of the plank into the frame. These nails are covered by the next stake of planking, and hidden in the finished boat. In examining the historic boats we were able to find a few of these nails, an artifact of the Herreshoff method. Holes for the plank lap fastenings were then drilled, and #14 copper nails driven though the laps. These are left long, protruding into the boat and will be riveted later in the process.

Planking proceeded in this way until the sheer strake was reached. These are made of mahogany and are molded in the typical Herreshoff style. We determined the shape of this profile by tracing the shape of the sheer strake of one of the boats at the Herreshoff Marine Museum and then ground a set of shaper cutters to match. The sheer strakes are ¾" thick along the upper edge and ¼" thick along their lower edge where they lap the next strake down. This cross sectional shape causes the planks to bend differently than parallel sided planks when sprung around the shape of the boat, making them a bit tricky to fit. After a careful trial fit, and an adjustment of the first shear strake spiling, we got out all six strakes in one round of milling, and set the planks aside for boats two and three.

Photo 10- Hull #1 removed from the jig. Plank lap fastenings awaiting riveting…a lot of riveting.

With the sheer strakes hung on the boat and the lap nails driven home, the hull was removed from the jig. To hold its beam to the proper dimension temporary cross spalls were notched over the sheer strake edges and clamped in place. The boat was set up on a low horse and all the plank lap rivets set. Before installing the frame rivets, the frame faces were rounded over with a scraper to re-create the look of Herreshoff small boat frames. We used the scraper method as described by Charlie Sylvester and Barry, but found it slow and hazardous, errant scraper corners can damage planking very quickly! To prevent damage and speed up the process we made a small router jig that made quick work of the task. After rounding and a final sanding the frame fastenings were installed and riveted.

As of this writing hull number one stands at this point of completion. The next step will be the installation of every other floor timber and frame pair, now missing from the boat, and the installation of all other interior details. Hull number two is on the jig and has garboard, broad and binder strakes installed. Hopefully at least one of these two boats is available for you to see during the Symposium.

Photo 11- Hull #2 with four strakes of planking on. Scott is adjusting a lap level.

CONCLUSION

The Herreshoff production method, as expected, has proven to be a very efficient method for producing multiple boats of the same design. While the actual build time for the second boat, at the time of this writing, remains undetermined, she is going together very quickly. To achieve this has taken quite a bit of time invested in setting up the system and working out some kinks. In order to re-capture the investment of time in the more extensive jig, patterns, and tooling, we hope to build several more boats. This project has been a fascinating experiment for us and has given us real insights into traditional wooden boat building in a factory-like, production setting. Through the project we were continually impressed by the high quality of work and the speed with which the original boats we examined were produced. With the building of three boats, it is clear to us that there is still much to be learned and many methods and skills to be honed. We look forward to building several more of these great yacht tenders.

ACKNOWLEDGEMENTS

This project was made possible, and very much more interesting, because of the involvement and support of several institutions and individuals. We would like to thank The Herreshoff Marine Museum in general and in particular John Palmiari, for easy access to their boats and resources, and for John's support and patience. The great collection and staff, past and present, at Mystic Seaport Museum also were central to this project. We are grateful for the support of Peter Vermilya, Curator of Small Craft at Mystic Seaport, for always being available, sometimes on very short notice, to allow us access to the fabulous collection of small craft under his supervision. Our approach to the construction of these boats was based almost entirely on the work of Barry Thomas and his book. We are grateful for Barry's friendship, support, and his insights freely given during his occasional visits to our shop during construction. We would also like to thank Maynard Bray for his involvement with this project, both during construction, and in the past in his role in the production of Barry's book, while at Mystic Seaport. Maynard generously provided the original copies of Mr. Sylvester's notes for our use and publication. His oversight of the project was always welcome and helpful. For access to a beautiful, historic example of a Columbia-derived boat we thank Warren Barker, and particularly Bill Mills. Bill was always willing to allow us to interrupt his day, share his experience, and has always extended a very open and collegial friendship to all of us and our shop. For his design work and the open sharing of his vast knowledge of boatbuilding, engineering, and things Herreshoff we thank Ed McClave. Working with Ed is always a pleasure and we are thankful to him for his help on this and other projects. Certainly not least of all we would like to thank the fellows who work with us, it is their skill and dedication that made this project possible - to them we are deeply indebted.

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ABOUT THE AUTHOR:

Photo courtesy of Eric Roth

David Snediker began his involvement with wooden boats aboard a collection of his Dad's leaky old boats on Great South Bay, Long Island. This interest led him to John Gardner's boat building classes at Mystic Seaport. Interest in historic preservation and boat building led to several years as a shipwright at Mystic Seaport's H.B. DuPont Preservation Shipyard. In 1988 along with partner Bill Taylor, he established Taylor and Snediker LLC, a boat building and restoration shop specializing in traditional boat building and wooden yacht restoration, located in Pawcatuck, CT. David holds a BA in anthropology from Connecticut College and resides in Mystic, CT.

APPENDIX

The attached handwritten notes were prepared for Maynard Bray by longtime Herreshoff employee Charlie Sylvester outlining the methods used to build small boats while at the Herreshoff yard. We are indebted to Mr. Bray for granting approval to print these documents.

now all other timbers are put in
with a clamp at top of sheer and drove
down tight to planking. now drill
3 or 4 holes for rivets (copper nails) from
inside through timber and lap of plank
and drive nails in, but not quite
through ~~b~~holding weight inside of
timber so timber will hug plank
When all timbers are in place you can
then smooth all timbers faces as
there are no nails in the way.
after smoothing timbers you bore all
nail holes out through timbers and plan
all nails are started in and holding a weight
inside near hole drive nails in, this pulls
plank + timbers up tight (nails drive tight,
so all nails are in, with burr set drive
burrs on all nails on timbers + cut off nail
for riveting.
burrs for planking in between are now all
put on with thumb + finger they are loose
with one hand outside and cutters in other hand
you make sure nail is in all the way and ~~with~~
if you wiggle the ~~..~~ cutters right the burrs will
stay on. cut all small nails at this time

now to rivet all nails on frames this
pulls frames + planking together well.
Rivet one hand the other holds weight
outside you can rivet all but one or
two lower laps in this way, you need
help for them.
last rivet lap nails or rivets same way
If you cut nails off right most ~~[illegible]~~ burrs
will stay on, 3 or 4 or more may fall off.
Have some one hold weight outside put burr
on, put a chip of wood on top of burr and
you can rivet it.

diminishing scale

all planks hand smoothed on bench
inside and out except those under floor
+ ceiling

Planks rabbeted forward + aft to take next
Plank just before putting plank on.
on bench

cap + pen left here

dinghy's built bottom up

Stem keel + stern put togather on bench

moulds set up (every other one) keel

assembly put on copper nails up throug

floor timber into keel.

timbers floor timbers are on moulds

after fairing up + stem rabbet, garboard is

put on. screwed along keel stem + stern.

Plank widths figured, and sheer strake

a little wider than top planks.

(use of diminishing scale)

Planks are beveled on bench for laps both

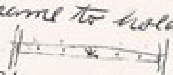
edges except garboard, when a plank is

on boat lap is checked so next plank

will fit and lay right on lap a small

boat nail is put in lap on frame to hold

frames in place temp.



a lay out of rivet spacing is made

on a stick so you can keep nails even

and all inbetween nails are put in laps

No large nails or rivets are put in frames

at this time. When planking is complete moulds

are unfastened from floor and boat

& moulds are turned right side up on

small horses cross bands nailed on sheer

strak top and moulds taken out

boat must be level fore + aft. and fastened to

horses.

Some of the early boats had flag pole

forward + aft grating in floor and

rudder + yoke

keep check on plank to make sure both

sides alike, as sheer strake goes on last

Moulded sheer strake

Corners of planks are rounded on outside in

finishing, (little corner plane,) all nail heads

outside filed flush to plank using file holder

after boat is riveted extra floor timbers are

fitted and screwed in.

floor boards and ceiling then seat risers or

stringers, next seats. Breast hook + quarter

knees + gunnel or clamp + stem band.

then over to finish outside

A Return to the Edwardian Era-
Completing CANGARDA
Initiating CORONET

Jeffrey Rutherford, Robert G. McNeil Ph.D.
Managing Directors, Coronet Restoration Partners
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 the1980'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.

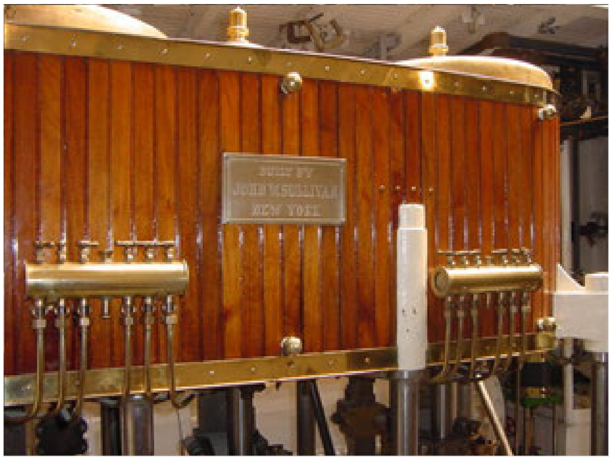


Figure 7 - Side casing of the main engine.

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)

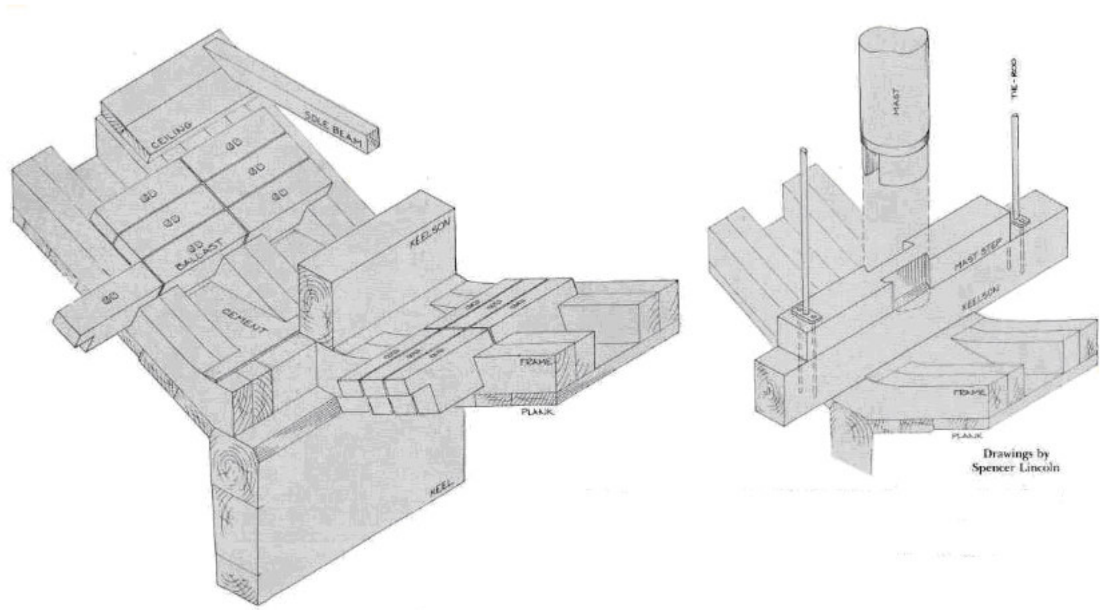


Figure – 14 CORONET Details of the frame and keel structure.

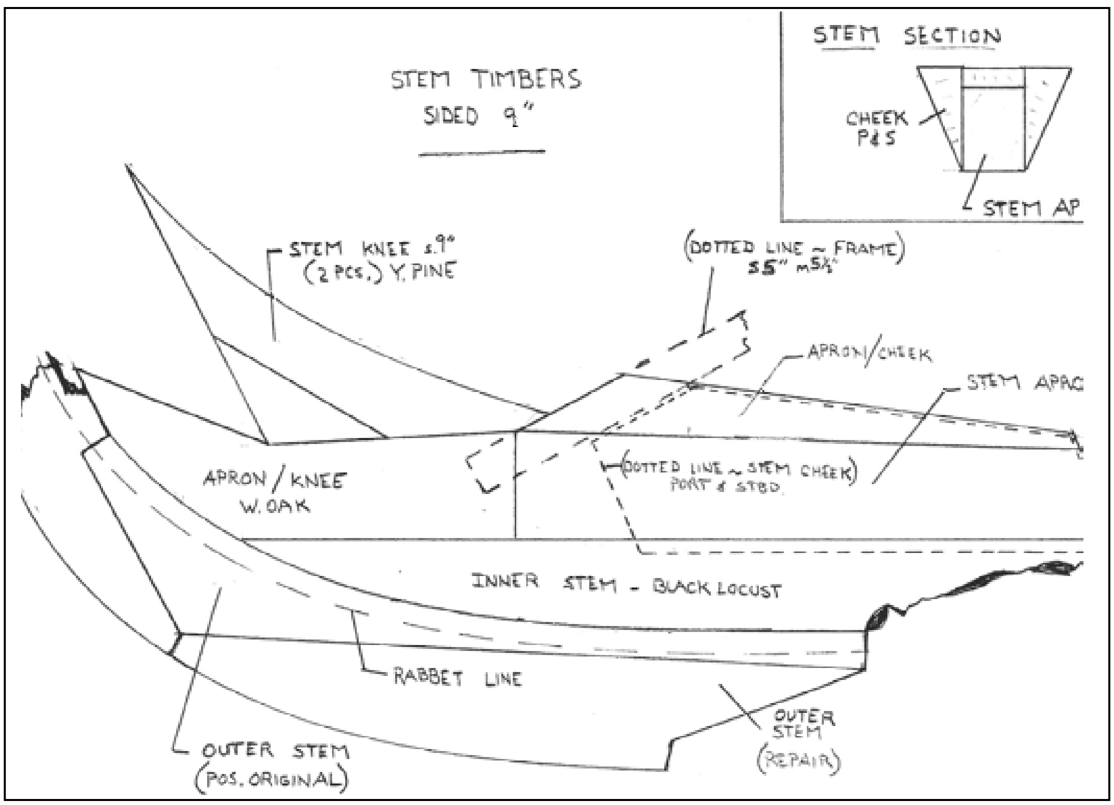


Figure – 15 CORONET Structure of the stem.

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.

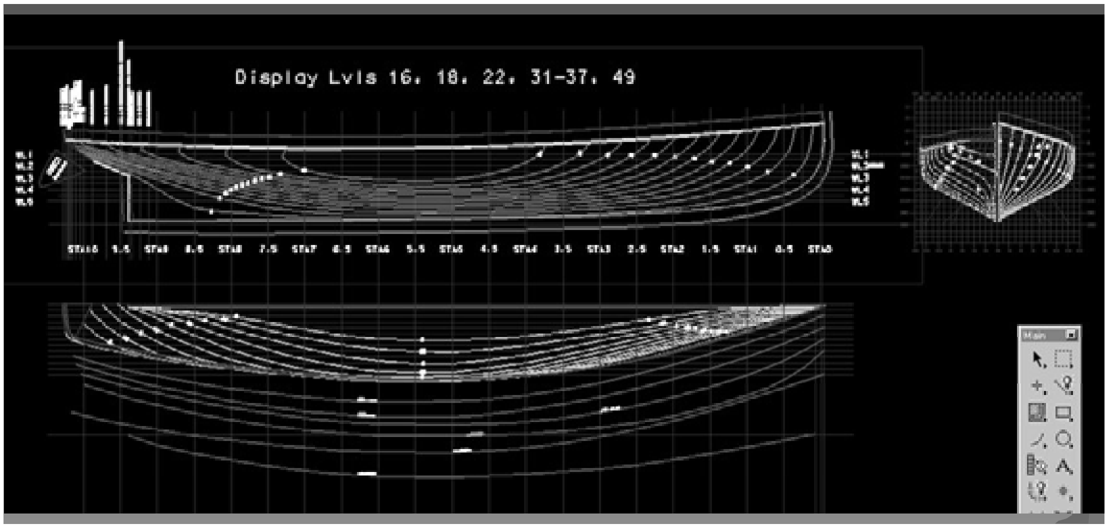


Figure 16 – CORONET Lines as reconstructed.

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?

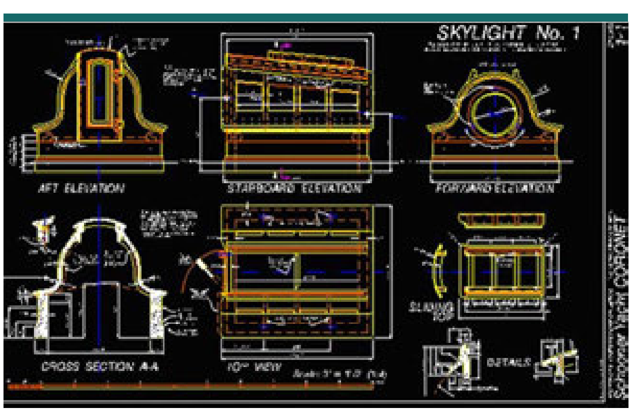
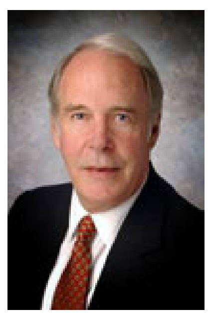


Figure 17 - Plans for a skylight.

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:



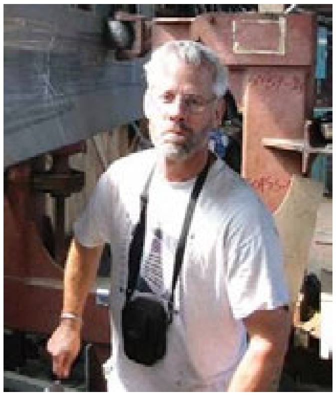
Robert G. McNeil, a graduate of University of California, Irvine, with a Ph.D in Biochemistry, Molecular Biology and Genetics, is the Managing Director of Sanderling Ventures LLC, a successful seed and early venture partnership. An avid wilderness hiker and ocean racing enthusiast he has many racing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

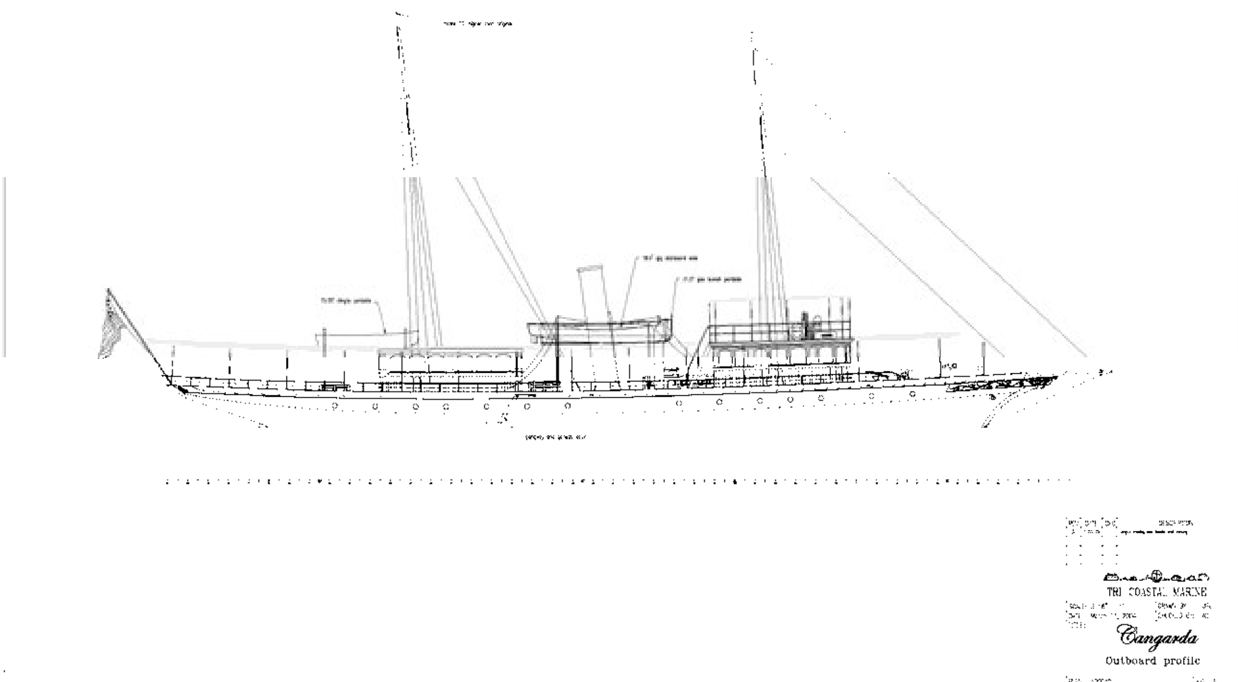
In ZEPHYRUS V first in class; first to finish, course record Long Beach to Isla Navidad, Mexico and first overall and course record 2003 Montego Bay Race

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.

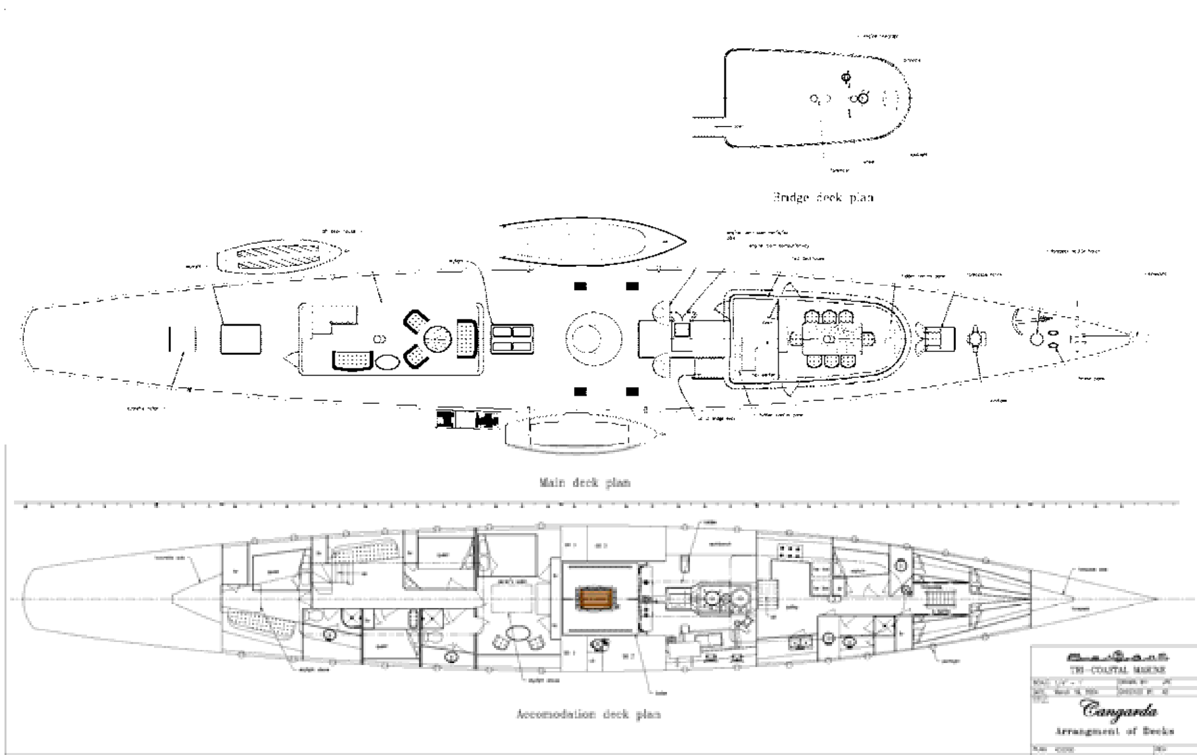


After being laid off from his warehouse job in New York City at the age of 20, **Jeffrey Rutherford** spent a year sailing in a workboat delivering grapefruit around the Caribbean. Watching men build boats on the beach with little more than a handsaw, a hammer and an axe, Jeffrey decided he wanted to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

S.NICOLÒ

SARAH

RIVIERA

ANNIE

SPARTAN - Courtesy Kathy Bray

COLUMBIA Dinghy

CANGARDA

I-Boat: SECOND WIND

CORSAIR

SPIRIT of NEW ENGLAND
144 foot Racing Schooner
To Race for the New International Fishermen's Trophy

David Stimson
Stimson Marine / Boothbay Harbor Shipyard

Figure 1-With a bone in her teeth, BLUENOSE has all sail set and drawing. She was undefeated over a seventeen-year run of the International Fishermen's Races. Courtesy of Knickle's Studio & Gallery

INTRODUCTION

The purpose of the design is threefold:

1. To challenge the new BLUENOSE IV to a race series for a new International Fishermen's Trophy, to be held in October of 2011.
2. To create a *magnum opus* of sailing yachts, combining beauty of line, simple, understated elegance, comfortable accommodation for owner and guests, speed, seaworthiness, and an easy motion in a seaway.
3. To establish a unique sailing school venue for young people to receive college credits, and help some to pursue a career working in large sailing vessels.

The specifications for the new schooner are as follows:

LOA: 144 feet
Beam: 25 feet 6 inches
Draft: 16 feet
Sail Area: (approx.) 9990 square feet
Displacement: 255 tons
Hull Speed: 15 knots

- **Crew**: Captain, 1st mate, 2nd mate, 3rd mate, Bosun, Steward, 2 cooks, 4 crew.

- **Paying students**: 32

- **Accommodation**: 2 staterooms w/ private heads, private saloon, full galley, captain's cabin, officer's quarters, staff & crew quarters, student quarters, navigation station, engine room, maintenance shop.

PART I – THE BLUENOSE IV CHALLENGE

A Brief Overview of Schooner Racing

The first International Fishermen's Trophy race series was held off Halifax, Nova Scotia in October, 1920. Earlier that fall, an America's Cup race between RESOLUTE and SHAMROCK IV had been called off for winds of 23 knots, and the boats and their attending yachtsmen were ridiculed by the publisher of the *Halifax Herald and Mail*. It was asserted that no Nova Scotia fisherman would have flinched at a bit of a breeze such as the one that cancelled the race. This inspired a challenge, "The Halifax Herald North Atlantic Fishermen's International Competition", issued to the fishermen of Gloucester, Massachusetts. It was to be a race for *real* sailors in their fishing schooners with an offer of a silver cup and $4000.00 in prize money for the winning vessel. Representing the city of Gloucester, the schooner ESPERANTO easily beat the Lunenburgers' DELAWANA in two straight races. Undaunted, the Canadians challenged the following year with a new schooner, BLUENOSE, designed by William J. Roué, winning the series against the smaller American defender ELSIE. BLUENOSE continued to dominate all of the American challengers, winning every series until the schooner races ended in 1938. (Figures 1 and 2)

The Challenge

The original BLUENOSE left her bones on a reef near Haiti in 1946 and a replica – BLUENOSE II - was built in 1963. With BLUENOSE II now nearing retirement age, a group of Canadians, led by the grand-daughter of BLUENOSE's designer, will be laying the keel for BLUENOSE IV in the summer of 2008 with the hope that an American challenger will be built to race for a new trophy. (The Canadian Government has the rights to the name "BLUENOSE III" – hence the name "BLUENOSE IV".) The SPIRIT OF NEW ENGLAND is being designed specifically to make that challenge. This paper addresses some of the design and engineering challenges that will need to be met in the creation of a large wooden sawn-frame racing schooner.

PART II – THE VESSEL

A new design to historical standards

The vessel will be built by Boothbay Harbor Shipyard to a new design by David Stimson and Nathaniel Stimson of Stimson Marine. The design is based on the best characteristics of the schooners that were built in the 1920's. Halsey Herreshoff and Adam Langerman of Herreshoff Designs will assist with the stability calculations and other technical aspects of the design. (Figure 3)

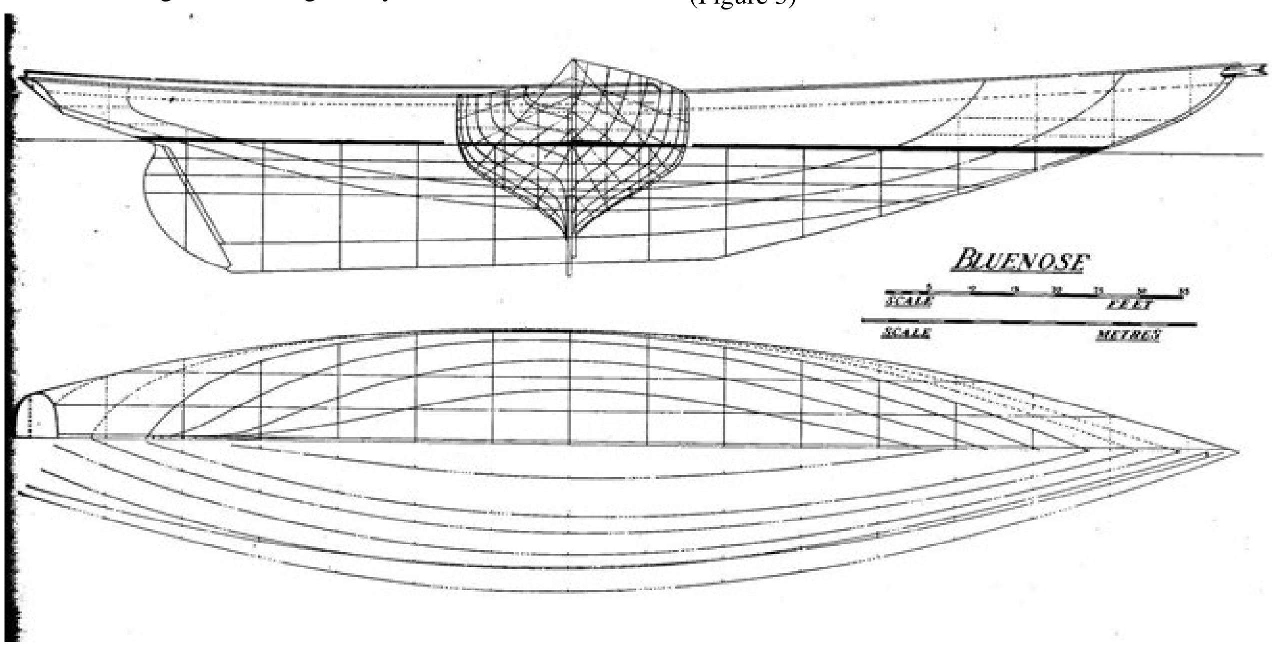


Figure 2 – Lines of BLUENOSE.

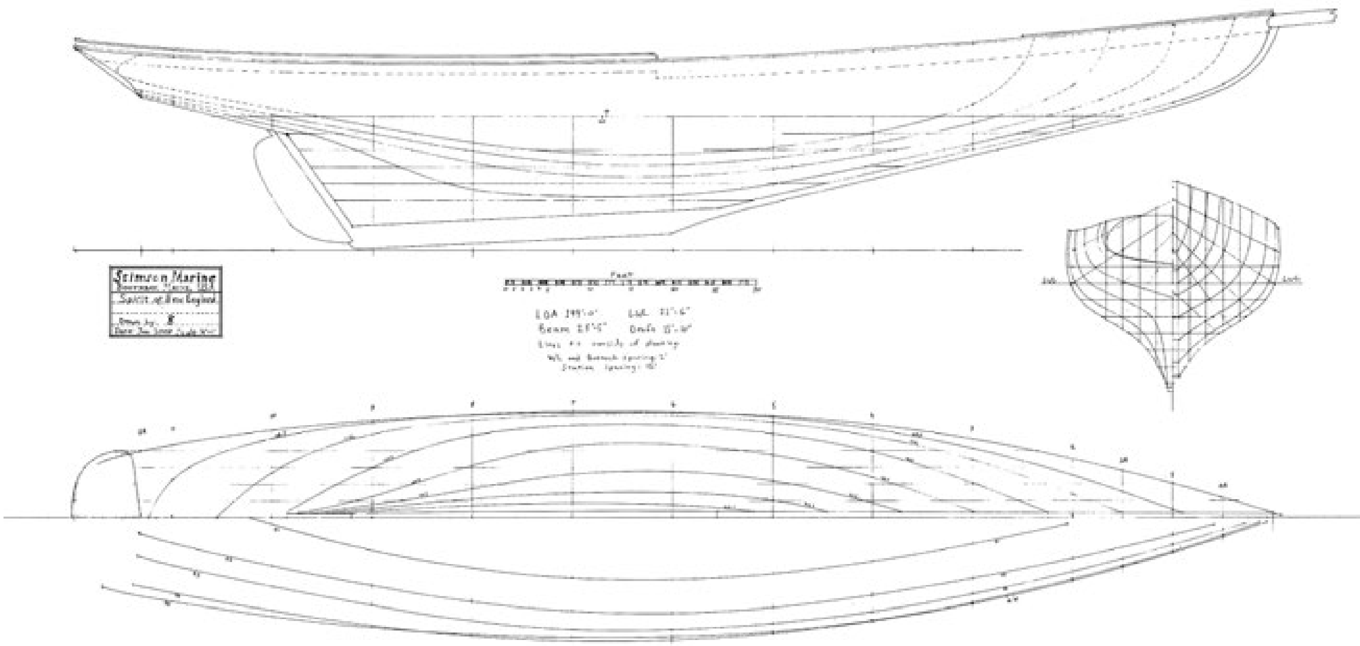


Figure 3 - Lines of SPIRIT of NEW ENGLAND. Stimson Marine Design

A replica of COLUMBIA (American challenger in 1923) or PURITAN (built in Essex, MA in 1922, she went aground and was lost off Sable Island before she could challenge for the trophy) was briefly considered, but these two American challengers of the 1920s were thought to be too extreme in design, with their low freeboard and sharp bows. (See Sidebar- Freeboard at the end of the paper.) BLUENOSE, although fast, was also a wholesome and seaworthy vessel, whereas PURITAN and COLUMBIA were essentially yachts in fishermen's clothing and treated as such (rightly so) by the race committee. In the 1920s and 30s, the Americans were never able to come up with a design that was equal to the BLUENOSE. In light air, the racy American boats could sometimes beat BLUENOSE, but when it breezed up, they would have their lee rail buried to the sheer poles and seas breaking over them, while BLUENOSE stayed on her feet and made good weather of it.

Figure 4 shows the schooner HENRY FORD during the 1922 race series against BLUENOSE. The FORD had half her deck buried, while BLUENOSE just had her rail down – a clear case of a smaller vessel with lower freeboard having trouble with carrying sail while a larger, higher-sided vessel could stand on her feet and make better progress to windward. A few seconds after this photo was taken, the fore topmast carried away.

A designer's half-model has been made for a hull that will combine good racing performance with the seaworthiness of a true fisherman. In the spirit of fair competition, the model is based on the general dimensions of BLUENOSE for overall length, waterline length, displacement and sail area. The designers have incorporated a number of features that are expected to yield performance that is superior to that offered by the BLUENOSE model. See Part III for a more detailed description of design features and refer to the Appendix for a tabular comparison of SPIRIT of NEW ENGLAND to previous schooners.

Construction

The vessel will be built according to time-honored methods, with judicious use of modern techniques and materials. The old schooners were built quickly and were not expected to last more than ten or twenty years. A few of the best-built schooners have survived for 100 years or more. By studying the old vessels, it is possible to ascertain what their strengths and weaknesses have been. By learning from this collective past experience, it is now possible to design and build a traditional wooden vessel specifically for longevity and low maintenance. For longest life and least upkeep, there are four essential elements:

- good design and engineering
- good workmanship and construction methods
- top quality materials that are best suited to the job
- a comprehensive maintenance program

(See Part IV for more detailed description of these elements, and how they relate to the proposed schooner.)

Figure 4 - Deck of fishing schooner HENRY FORD, International Fishermen's Race, Oct. 21, 1922. © Mystic Seaport, Rosenfeld Collection, #9191F

PART III

Design Elements

In any design that will be used for both cruising and racing, the opposing factors of speed and seaworthiness must be carefully considered. In many cases, elements that contribute to racing performance will necessarily detract from safety and comfort in heavy weather. Likewise, there are features that could be incorporated to improve seaworthiness that would have a negative effect on speed. Elements that could be said to improve speed at the expense of seaworthiness (or seakindliness) include:

- long overhangs with low ends for increased sailing length in stronger breezes
- low freeboard for weight savings and decreased wind resistance
- sharp entrance angle for windward ability in a chop
- flat run & counter
- low center of gravity for carrying sail- increases ultimate stability (good) but contributes to cranky motion (bad)
- a hard bilge for sail carrying- also contributes to cranky motion
- low hull weight/ light scantlings
- excess sail area

To elaborate on these points:

The long overhangs tend to pound in a seaway, which is hard on the nerves of the crew, as well as the structure of the vessel. Low freeboard decreases reserve stability and allows seas to board the vessel more easily. A sharp entrance angle decreases buoyancy in the bow, encouraging rooting and broaching-to in a following sea. A wide, flat counter exacerbates the broaching tendency and will pound in a seaway. Cranky motion from low CG and hard bilge is hard on spars and crew. Low hull weight also contributes to a quick motion, and light scantlings will cause the vessel to work and open her seams in bad weather. Excess sail area requires longer, heavier spars, reduces stability, and makes for difficult handling. The above factors will need to be used in moderation if the vessel is to be safe and comfortable, as well as fast.

Elements that contribute to seaworthiness include:

- rockered profile
- strong sheer
- reserve buoyancy in ends
- low CG
- narrow beam- for recovery from below-90-degree knockdown
- full bow sections and cutaway forefoot- for better downwind handling in heavy going
- moderate-to-heavy scantlings

With the exception of low CG and cutaway forefoot, all of the above characteristics could be said to have a negative effect on speed, while improving seaworthiness. Fortunately, a well-built vessel of this size can have a fair degree of speed-giving elements, and still be extremely seaworthy. During her long working career, BLUENOSE successfully weathered a number of bad storms including a couple of hurricanes that caused great damage to the fishing fleets.

Deed of Gift

To promote seaworthiness and fair competition, and to discourage the propagation of freakish designs, the original deed of gift for the Fishermen's Trophy put restrictions on the design and construction of the schooners that were to participate in racing for the cup. The rules were modified slightly after the first racing season. The SPIRIT of NEW ENGLAND is being designed and engineered to the same parameters that were in effect in 1921so that she will be able to race against BLUENOSE IV on an equal basis. The rules that govern design and construction are as follows:

- overall length not to exceed 145 feet
- waterline length not to exceed 112 feet
- draft not to exceed 16 feet
- total sail area not to exceed 80% of the square of the waterline length expressed in feet
- the combined areas of mainsail and main topsail may not exceed 50% of total sail area
- no outside ballast
- inside ballast may not have a specific gravity that is greater than iron

A well-designed, well handled larger vessel will almost always out-sail an equally well designed and handled smaller vessel. All of the American challengers were considerably smaller than BLUENOSE, which helps to explain their lack of success. With this in mind, the SPIRIT of NEW ENGLAND is being designed within inches of the allowable dimensions.

Design Concept for the Challenger

Besides building to maximum allowable dimensions, there are a few features than can be explored to promote speed, while minimizing the penalties on seaworthiness. Elements that were incorporated into SPIRIT of NEW ENGLAND's design include:

- increased ballast/weight ratio
- cutaway forefoot and raking sternpost
- turn of bilge kept low in the ends
- center of buoyancy moved forward compared to American challengers
- lower CG of ballast
- long, easy run
- ample (but not excessive) freeboard
- lower displacement
- lighter spars
- better cut and shape control of sails

To elaborate on each of the above:

The improvement in ballast/weight ratio will be derived more from decrease in hull weight than increase in ballast. This will be accomplished by paying close attention to the weight of interior joinery, and by engineering the structure of the hull to eliminate material that doesn't contribute to strength. Higher ballast/weight ratio translates directly to power for carrying sail, and also allows for recovery from a greater angle of knockdown. If the figures from historical sources are reliable, BLUENOSE carried 40 tons of ballast with a total displacement of 280 tons. This gives her a ballast/displacement ratio of just over 14%. In SPIRIT of NEW ENGLAND we hope to be able to save 35 tons in hull weight. This will allow us to add 10 tons of ballast, yet her total displacement will be 25 tons lighter than BLUENOSE. Ballast/displacement ratio will increase to about 20%.

The combination of cutaway forefoot and raking sternpost offers decreased wetted surface, and more importantly, it reduces heeling in strong winds. I believe that many traditional keelboat designs suffer from excess lateral plane, which increases heeling from the opposing sideways pressures of rig and keel. Rig pressure to heel is resisted by two things – form stability (i.e. CB moving to leeward), and stability from low ballast, (i.e. CG moving to windward). Lateral plane in no way adds to stability, and must necessarily detract from it as it gives the sail plan a fulcrum for the rig pressure to act against. In reading accounts of the development of yacht design in the second half of the 19th century, the success of N.G. Herreshoff's 1891 GLORIANA is mostly attributed to reduction of wetted surface, and (probably erroneously) the shape of her bow. (Figure 5) In actuality, her increased ability to carry sail because of reduced keel area is likely to be of equal importance in her success. In studying the designs and history of fishing vessels between the years of 1890 and 1930, it is apparent that most of the vessels that were considered to be fast to windward had shorter, deeper keels. The keel profile for SPIRIT of NEW ENGLAND was developed with this principle in mind, and is somewhat (but not drastically) shorter than BLUENOSE's.

Figure 5 - Half hull model of GLORIANA. Courtesy Herreshoff Marine Museum

Having the turn of the bilge kept high amidships and low in the ends will add markedly to initial stability, and therefore ability to carry sail. Most races are won by windward performance. Initial stability is of utmost importance in this regard. With a high turn of the bilge amidships, the center of buoyancy moves rapidly to leeward as the vessel heels. Keeping the turn of the bilge low in the ends allows the hull to gain stability over a greater length as she heels. Increased sailing length is a helpful side effect that increases potential hull speed. The speed of displacement hulls being limited by the distance between bow and stern waves, anything that can be done to separate the two waves will help to increase performance in higher wind speeds. In this case, the bilge kept low in the ends will distribute the vessel's displacement towards the ends as she heels and gains speed. This has the effect of driving the bow and stern waves down and separating them further. Pitch damping is another fringe benefit from the low bilge in the ends. Much energy is sapped by pitching when going to windward in a chop, and the proposed design will minimize pitching.

Even the largest of the old schooners had keels that were only 12 inches wide. This was probably mostly because of economic considerations. In SPIRIT of NEW ENGLAND, by increasing the width of keel to 18 inches, we will be able to stow the ballast lower down. Lowering the center of gravity of the ballast by two or three feet will have a positive effect on stability.

Many of the American fishing schooners were found to trim by the head after launching and before they were ballasted. Putting them in fore and aft trim required ballast further aft, way up in the tuck. This gave a higher center of gravity, and therefore less stability for the amount of ballast carried. By moving the center of buoyancy forward in the SPIRIT of NEW ENGLAND, the ballast can be stowed amidships, down low, where it does the most good. This gives yet another increase in stability and power to carry sail.

Every effort will be made to keep the weight out of the ends of the vessel. Having ballast, engine(s), batteries and tanks concentrated amidships will reduce pitching inertia, allowing the pitch damping characteristics of the hull to be most effective.

A long easy run helps to reduce the size and resulting drag of the stern wave. Anything that can be done to decrease resistance will help in the quest for speed.

Freeboard is necessary for reserve stability. This is important for recovery from a knockdown, and for carrying sail in strong winds. The American challengers all had low freeboard, which was helpful in light airs, but was a severe handicap in heavy going. Burying the rail and half the deck may have made the vessels *seem* to be going fast, but the added drag did nothing but slow them down. Undeniably, BLUENOSE, with her higher freeboard, had far greater power to hang onto sail than her American adversaries. SPIRIT of NEW ENGLAND has a few inches more freeboard than does BLUENOSE.

A vessel must push aside water equal to her displacement, and pushing aside water causes drag. By engineering the hull and interior joinery for lightness without sacrificing strength, we hope to cut about 10% from BLUENOSE's displacement of 280 tons. Yet, the SPIRIT of NEW ENGLAND will still have equal ability to carry sail because of the design features described here. The combination of lighter weight and better stability can be expected to yield a significant improvement in windward performance over BLUENOSE.

Rig (Figures 6 & 7)

Although the deed of gift specifies canvas for sails, it is hoped that both BLUENOSE IV and SPIRIT of NEW ENGLAND will be allowed to use Dacron (polyester) for sail material. It is much lighter and stronger than canvas, and won't rot or mildew. We have made the suggestion for using synthetic sail cloth to the BLUENOSE IV committee, and hope to hear back from them soon.

Since the sail area is limited by waterline length, we need to look at other options besides increasing sail area to improve performance. We considered increasing aspect ratio of the sails, but deemed it to be impractical. Increasing the height of the masts by even a small amount would drastically reduce stability. We have decided to stay with tried-and-true proportions for all of the working sails, focusing our improvements on reducing weight aloft wherever possible, and improving the cut and sheeting angles of the sails. A baggy sail hurts pointing ability and increases heeling in stronger winds. Increasing the length of travelers will impart more downward pull on the leeches of the sails, thereby reducing excessive twist caused by sagging gaffs. A vang may be fitted on the fore gaff. The masts and spars will be made of solid, laminated eastern spruce instead of Douglas fir, and the weight savings are expected to have an extremely positive effect on stability. The rest of the rig will be traditional, with deadeyes and lanyards for tensioning the shrouds, galvanized wire rigging, parceled and served, wood shell blocks, and forged iron hardware. The running rigging will be 3-strand twisted Dacron rope.

The Design Process

We are fortunate that there is a huge base of historical data on the design, construction and performance of the old fishing schooners. Those vessels that won reputations for speed and seaworthiness can be studied, and their best features adopted to ensure success in a new design. The fact that we are building on a tradition instead of exploring the cutting edge of design technology allows us to feel confident that the new vessel will perform at least as well as expected.

It seemed appropriate that the new design should take shape in the traditional manner - by carving a half model, and then taking the lines off to make the drawings. We started by gluing up a block out of lifts of wood – white pine above the waterline and mahogany below. We then drew the proposed profile on the block and cut it out on the band saw. The model was carved, starting with gouges and a mallet, graduating to spoke shave and block plane, and finishing with sandpaper glued to a narrow, flexible board. Designing by half model allows one to view the lines from all angles, and feel for fairness with the fingertips. Not even computer programs can offer the same degree of tactile and visual feedback. The model is also useful for showing up unwanted illusions in the sheer line that can result from the combined elements of profile and plan view, and flare transitioning to tumblehome. (Figure 8)

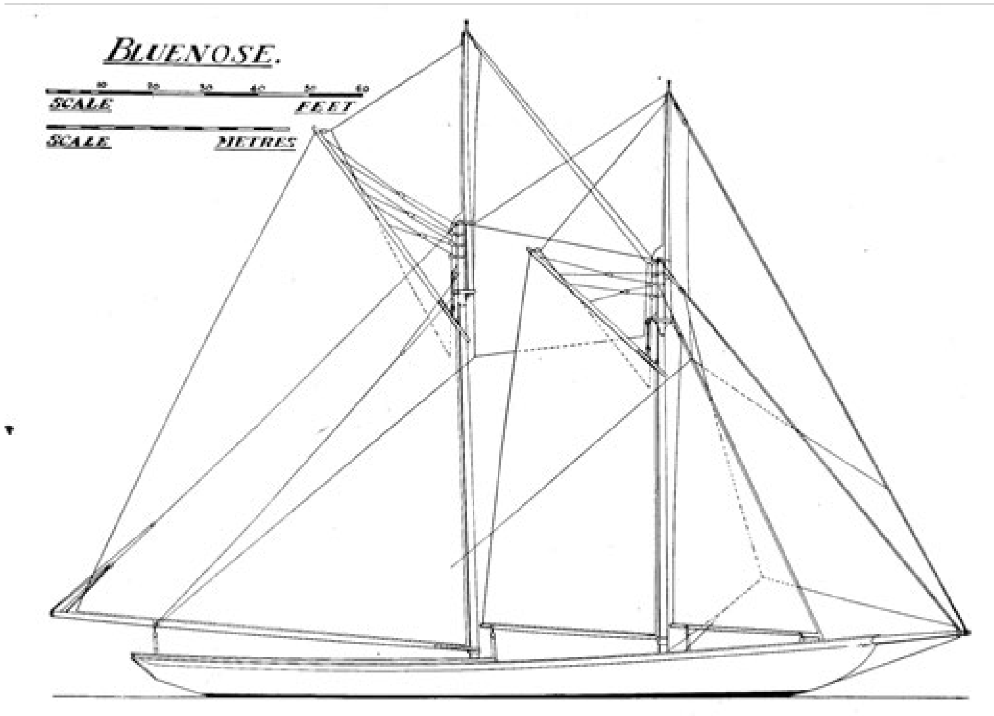


Figure 6 – Sail Plan of BLUNOSE.

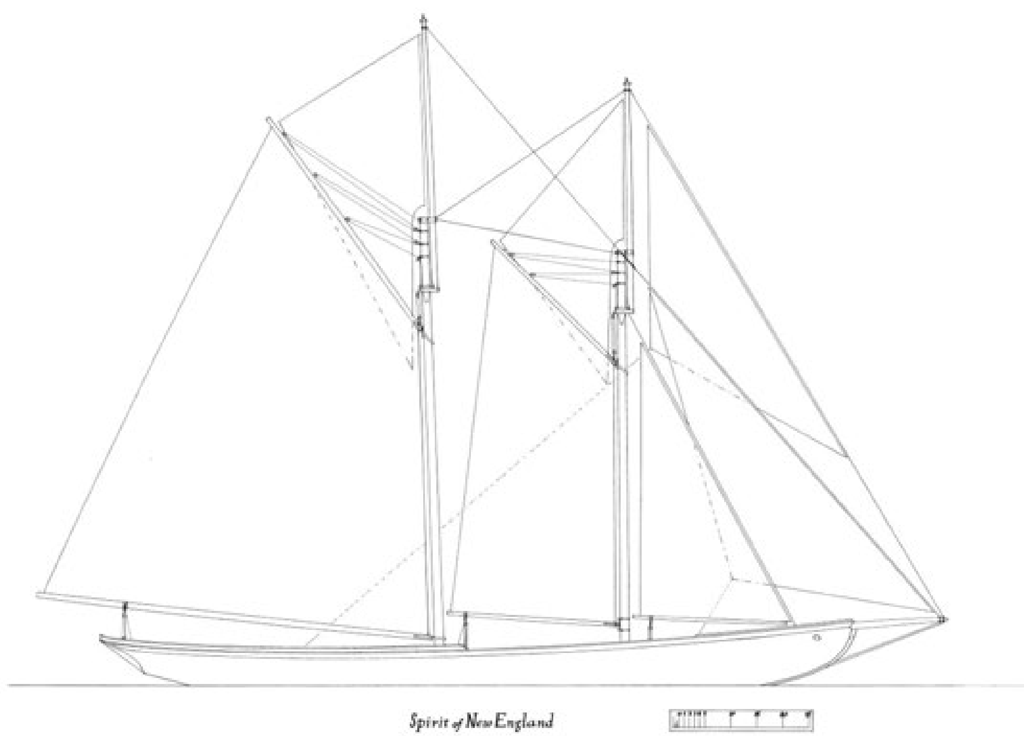


Figure 7 – Sail Plan of SPIRIT OF NEW ENGLAND. Stimson Marine Design

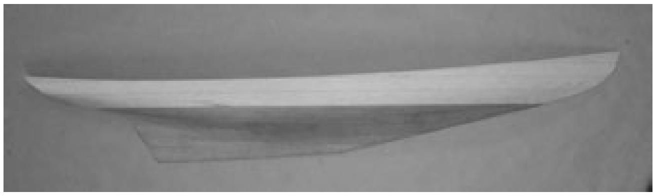


Figure 8 – Half hull model of SPIRIT of NEW ENGLAND. Stimson Marine Design

After the model was made, the profile was transferred to paper and a sail plan was drawn. The CE (Center of Effort) and CLP (Center of Lateral Plane) were then established to check that the proper amount of lead was present.

In December, 2007, my son Nathaniel and I made a trip to the Herreshoff Museum in Bristol R.I. to meet with Halsey Herreshoff (Nathanael G. Herreshoff's grandson). Halsey had agreed to help us take the offsets of the model using offset reading machine that Capt. Nat had designed for taking the lines off of his half models. We set up the model on the beautifully machined surface and Halsey read off the height and width coordinates for each station from the specially made micrometers that attached to the face of the bed. As the offsets came off of the model, they were entered into an Excel spreadsheet. Naval Architect Adam Langerman of Herreshoff Designs brought the data over to the design office, and in less than an hour we had a printout of the body plan of the vessel and some basic numbers for displacement, vertical and longitudinal centers of buoyancy, wetted surface, and area of midsection. The combination of old methods for aesthetic considerations and new technology for engineering and hydrostatic calculations has given us the best of both worlds. It was a real thrill for us to be able to use the same offset machine that the "Wizard of Bristol" had used to take the lines for his Cup defenders more than 100 years ago. (Figure 9)

Figure 9 – Measuring the half hull model of SPIRIT of NEW ENGLAND.

PART IV

Construction & Engineering

The larger racing fishing schooners were almost too big for practicality in all-wood construction. Certainly, there have been much larger vessels built in wood, but being square-rigged, they did not undergo the terrific strains that must be endured by a fore & aft rigged vessel while being driven hard to windward. Fortunately, the big schooners were built with inside ballast, as their hulls as built could never have withstood the leverage that would be imparted by an outside ballast keel.

In engineering the hull for SPIRIT of NEW ENGLAND, we plan to use the same basic construction methods that were commonly used in the fishing schooners in the early 20th century. However, the new schooner will need to pass Coast Guard standards for inspected vessels, and maintenance costs will need to be kept as low as possible. With this in mind, it will be necessary to make a few departures from the old methods. These changes will not be visible, and the vessel will look entirely traditional when launched.

We hope to make some significant structural improvements over the old schooners, without a corresponding increase in construction costs. The two biggest problems faced by large wooden vessels are rot and loss of shape, usually in the form of hogging. These can be addressed as follows:

Rot

Rot can be prevented by a number of means. Keeping moisture out of the joints in hull and deck is paramount. Using rot-resistant species of wood also helps a great deal. A good maintenance program is also very important. With good construction, materials and maintenance, a wooden vessel can be expected to last fifty years or more without need for significant repairs. Conversely, a poorly built vessel could easily become a bucket of rot in five years or less if badly maintained.

The following steps will be taken to reduce the likelihood of rot in SPIRIT of NEW ENGLAND:

- A highly rot-resistant South American wood called Angelique will be used in rot-prone areas. This includes sheer strakes, hatch coamings, stem, transom frame, and bulwark stanchions.
- All faying surfaces will be painted and bedded prior to assembly.
- All joinery will be of the highest quality.

- Steel fasteners will not be used.
- The use of sapwood will be avoided at all costs.
- A comprehensive written maintenance plan will be provided by the designers.

Prevention of Hogging

Hogging is often blamed on the weight of overhangs, and the upward pull of the shrouds on the chain plates. Although these are factors to be considered, the #1 cause of hogging is the tremendous water pressure that is constantly acting on the middle of the vessel, where the greatest buoyancy is concentrated. The water pressure that is exerted on the hull is perpendicular to the planking surface. Fishing schooners usually have a great deal of deadrise in their sections, so the hogging force is a combination of upward and inward pressure. The upward component of the pressure may raise the keel and sheerline by a foot or more amidships after a few decades. The inward component of water pressure does not affect the keel, but it contributes markedly to the distortion of the sheer.

Hogging can be prevented by stiffening the hull longitudinally, and by stiffening it transversely. Longitudinal stiffening in a single-planked hull can best be accomplished through proper installation and maintenance of caulking. When a hull is well caulked, the friction in the seams keeps the planks from sliding with respect to one another, and the hull becomes a structural unit. If the caulking is poor, the planks can slide against their neighbors, and the stiffness of the hull is reduced to the sum of the stiffness of the individual planks.*

The caulking in a vessel of this type and size consists of one strand of cotton and two strands of oakum. A good caulker will "make" the caulking into the seams with thin strands, tightly looped. The loops should go in roughly perpendicular to the seam, forming thousands of small wedges that create the needed friction between planks. Caulking that is installed in heavy strands with long loops that are nearly parallel to the seam will soon roll out of the seam as the vessel works. The oakum should be "double-hawsed", which means that each strand is set with a hawse iron after it is made into the seam. This is a two-man job – one holding the hawse iron (which is a large caulking iron with a long handle) and the other swinging a large wooden "Beetle" – a heavy mallet that is about the same weight as a sledge hammer.

On older vessels, much effort is often expended on longitudinal fixes, and the transverse structure is likely to be ignored. Yet the inward squeezing caused by water pressure amidships is often the biggest cause of distortion. A combination of vertical tension rods from keel to center of deck beams and compression posts from turn of bilge to center of deck beams would be a good way to help prevent the inward pressure from distorting the sheer. If the inside ballast is placed near the vertical tension rods, the weight of the ballast will be transferred from the tension rods to the center of the deck beams, thus counteracting the inward pressure of the compression posts. Solid steel bulkheads are another option. Since they will be needed anyway to satisfy Coast Guard requirements for watertight compartments, we plan to use steel bulkheads in SPIRIT of NEW ENGLAND. The tie rods and compression posts will be added in areas where bulkheads are not needed or desired.

<u>A side note about longitudinal stiffness and performance:</u>

The men who sailed and raced fishing schooners believed that it took a few years before a new schooner could start to show her best performance. New vessels were quite stiff longitudinally, and it was thought that an older, more limber hull would undulate over the seas instead of fighting them. In *The Book of the Gloucester Fishermen*, 1927, James B. Connolly writes "Any old fisherman will tell you that a vessel never does do her best sailing until she's been driven hard for two or three years. When you can feel her deck begin to crawl under your feet, then she's fit to go right." The Aleutian Baidarkas worked on the same principle, the frame being assembled with pieces of whalebone in the lashed joints to allow the boat to flex to the contours of the waves. This was carefully researched by George Dyson in his paper *Form and Function of the Baidarka,* 1991, published by the Baidarka Historical Society, and in his book *Baidarka*, published by Alaska Northwest Books, 1986. Another example of this phenomenon is given by Richard Henry Dana in *Two Years Before the Mast*. After leaving San Francisco, their vessel was packed so tightly with hides that she felt stiff and lifeless, and lacked her usual sailing ability.

It makes sense to me that a hull with longitudinal flexibility could go more easily to windward through a chop. Pitching saps a great deal of forward energy by adding a vertical component, and robs the sail plan of power by adding fore & aft movement to the rig. If the bow and stern can lift and sag a bit to conform partially

*This is, of course, an over-simplification. Some stiffness is added from diagonal offset of fastenings, friction in plank/frame surfaces, etc, but the principle holds.

to the waves, perhaps a little less energy will be lost. Modern designers shy away from flexibility, partly because modern hulls have good pitch-damping characteristics, and partly because they want to keep the luffs of their headsails taut.

In designing SPIRIT of NEW ENGLAND, by carefully engineering the hull to resist hogging, we may inadvertently be taking away slightly from the vessel's future performance. Fortunately, both schooners will be new, and equally stiff when the races take place.

Saving Weight Without Sacrificing Strength

Any material that adds mass without adding appreciably to strength is a double detriment. First, it reduces the amount of weight that can be used in ballast, where it has the most beneficial effect on stability. Secondly, the inertia from the mass of unneeded material puts undue stress on the part of the structure that is doing all of the work. We plan to save weight by carefully sizing all of the vessel's scantlings, by tapering the frames from heel to sheer, and by choosing for each component the species of wood that will be best suited to the task.

Hardwoods hold fastenings well. Select softwoods have better stiffness-to-weight ratios than most hardwoods. In general, we plan to use hardwoods for framing and backbone, and softwoods for planking, ceiling and interior joinery. As long as availability is not an issue, our choices of wood for SPIRIT of NEW ENGLAND are as follows:

- Backbone: angelique or white oak
- Framing: double-sawn white oak
- Stanchions: angelique or locust
- Deck beams & carlins: butternut
- Topside planking: old-growth longleaf yellow pine
- Bottom planking: white oak
- Ceiling: eastern spruce
- Deck: eastern white pine
- Deck joinery: silver balli
- Rudderpost & rudder: angelique
- Spars: eastern spruce
- Trunnels: black locust
- Sheer strakes, garboards & broad strakes angelique
- Lodging and hanging knees: hackmatack
- Interior joinery: northern white cedar with butternut bulkhead facing and trim

Trunnel Fastenings

The best plank fastening for a large wooden vessel is still the simplest – the locust trunnel. Trunnels are also used for fastening frame futtocks together. Futtocks are the individual sections that make up traditional double-sawn frames. Each frame consists of two layers of wood – one forward and one aft, with the joints staggered. Trunnels have more surface area than bolts or ship spikes, so they don't distort the holes and work loose. As the green oak frames season, the holes shrink around the trunnels, locking the plank securely to the frame. Trunnels won't rust or corrode, and they are not expensive.

In ship construction, some trunnels go right through planking, frame and ceiling. Both ends are split, and wedges are driven in perpendicular to the grain of the planking. Some trunnels are driven "blind", which means that the hole ends in the middle of the frame instead of going all the way through. In this case, the trunnel is split and a wedge is inserted prior to driving. As the wedge fetches up on the bottom of the hole, it expands the end of the trunnel, locking it in permanently. The outboard end of the trunnel is then split and wedged in the usual manner. It will take approximately 18,000 trunnels to fasten the planking on SPIRIT of NEW ENGLAND.

A Few Notes on Aesthetics

Yacht designing is an art as well as a science, and there is a great deal of room for artistic expression, while staying within the parameters of design requirements. Subtle changes in line and form can often make the difference between an average-looking vessel and a stunningly beautiful one. Although it may be true that beauty is in the eye of the beholder, it seems that there are some classic vessels that are universally considered to be extremely handsome. It would be difficult, if not impossible to find a formula for what makes these particular vessels stand out as masterpieces. Perfection of proportion is something that comes from deep within, defying description (or dissection) by those who possess analytical minds. Even so, there are individual elements of line and form that can be described and utilized; an awareness of how these elements affect aesthetics can be helpful towards the success of a design as an artistic whole.

I consider the sheerline to be the most important line in the vessel. If the sheerline is wavy or if it doesn't interact well with the deck line in plan view, there is no hope for beauty in the rest of the design. It is important to have a clear understanding of illusions, and how they can affect the apparent shape of the sheer as viewed from various angles. Vessels that have marked tumblehome in the aft sections, round sterned boats, and double-enders with full deck lines aft will require a sheerline that has a quick rise in the after end, to avoid the illusion of drooping when viewed from the quarter. Likewise, boats such as catboats with a full deckline forward will need a quick rise in the sheer at the bow to avoid the illusion of "moose shoulders", or powderhorn sheer. The SPIRIT of NEW ENGLAND has a great deal of tumblehome in the aft sections where the deck line fairs into an elliptical (in plan view) bulwark. In designing with a half model, it was an easy matter to shape the sheerline aft in both plan and profile views simultaneously, establishing a curve that looks nice from all angles.

The curve of the stem is also important. Best not to use the arc of a circle here, as it will be likely to yield a generic look that lacks life. There is infinite room for creativity in stem profiles, and the work of some designers can be recognized by this feature alone.

The shape of the transom, as viewed from astern, can make or break a design. Here again, the half model is invaluable. I have found that if the model is well shaped, and the topsides blend nicely into the bottom, the transom almost designs itself. Most designs that take form on paper evolve in the opposite manner; the transom shape is drawn early in the game, and helps to determine the shape of the rest of the stern. To me, this is somewhat limiting, as it is easy to draw a transom shape that looks good on its own, but that particular shape may help to dictate a stern shape that is not optimal for the rest of the hull.

After designing by half model fell out of favor, some of the best known designers of the twentieth century had a tendency to fuss transom shapes to death. The curves are so perfect that they look contrived to me, and I can visualize the number of late nights that were spent over a single curve. I believe that a transom should be the natural extension of the hull's shape and not the other way 'round.

When a nicely designed boat is ashore in her cradle, the view of her run from just forward of amidships is a joy to behold. The subtle way in which the transition takes place from midsection to stern, the way the tuck is formed to allow the water to slip aft with the least amount of fuss – this is another place where pure artistry is evident.

A few aesthetic points regarding rig:

- In schooners, it is usual to give the mainmast a bit more rake than the fore. If the masts were made parallel, there would be an illusion that the masts were converging at the top.
- In general, with gaff sails, the angle of the gaff should be about 90 degrees to a diagonal line drawn from clew to throat. Since main booms are usually longer that fore booms, the main gaff will be peaked higher than the fore.
- Nicely tapered spars make a world of difference in the looks of a rig
- A schooner doesn't look right unless the topmasts are sprung forward a bit. The practical reason for doing this is that it allows the topsails to set flatter.

Careful consideration of these points will not guarantee a beautiful design. They are useful tools, though, that can be incorporated along with a good sense of proportion to increase the chances of success.

CONCLUSION

In spite of the careful thinking that has gone into the design and construction details of SPIRIT of NEW ENGLAND, winning the race series is far from being a foregone conclusion. BLUENOSE was a particularly able vessel, and if we have made any improvements, they will be small ones. It is likely that, in the end, the winning vessel will be the one that is sailed the best. It will take a lot of time and work to train a crew to tack efficiently in a schooner that is carrying 10,000 square feet of sail, shifting the huge fisherman staysail with each tack.

Few people alive can remember the thrill that can be evoked when of a pair of really big schooners vie with each other, neck and neck, bound for the finish line. BLUENOSE IV and her challenger have a chance to bring this same thrill to a new generation, thus preserving the experience in our collective memory for a good part of this century.

Sidebar- Freeboard:

The effect of freeboard on seaworthiness and sail-carrying power can be seen in a comparison between COLUMBIA and SPIRIT of NEW ENGLAND. At the lowest point, SPIRIT of NEW ENGLAND's main deck is a full 4'-6" above the waterline, while COLUMBIA's freeboard is only 2'-11". In Figures 10 and 11, it can be seen that COLUMBIA puts her scuppers under at 13 degrees of heel, while SPIRIT of NEW ENGLAND keeps her decks dry until she reaches 20 degrees. When COLUMBIA heels to 20 degrees, ten feet of her lee side deck becomes submerged. Once the lee deck is submerged, stability begins to drop off rapidly, and the bulwarks and rigging add a considerable amount of drag. BLUENOSE puts her scuppers under at a 19 degree angle of heel.

I just finished reading the book *Bluenose Skipper*, by G.J. Gillespie, who gives a first-hand account of racing in BLUENOSE against the low-freeboard Gloucester schooners. It tells how the American schooners would be heeling with 12 feet of their decks buried when BLUENOSE was just starting to dip her rail. It makes a pretty strong case for my beliefs about the necessity for ample reserve stability in schooner design. McManus (designer of HENRY FORD) was a "shootfrom-the-hip" type of designer, but Starling Burgess (designer of COLUMBIA and PURITAN) was not. It surprises me that he didn't appear to be concerned about the relatively simple concept of using ample depth of hull and freeboard to increase the critical angle of heel. Perhaps he was gambling on the weather and hoping for a good percentage of light winds during the races. If this was the case, he was also gambling with the lives of the fishermen who were required to make the vessel pay her way on the fishing banks. COLUMBIA was lost with all hands off of Sable Island during the terrible hurricane of 1927. A year later, she was raised to the surface completely intact by a dragger that had snagged the schooner in her gear. From this it is apparent that her foundering was caused by capsizing. One can only speculate as to how she would have fared if she had been given the depth and freeboard enjoyed by BLUENOSE and SPIRIT of NEW ENGLAND. The fact that BLUENOSE successfully weathered the same storm not far from the spot where COLUMBIA went down might be at least partially attributed to her more wholesome proportions.

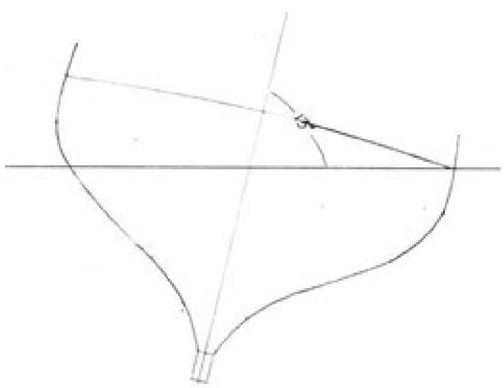


Figure 10 – Midship section of schooner COLUMBIA at 13 degrees. Stimson Marine Design

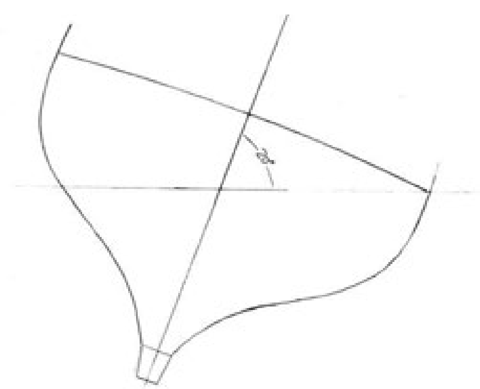


Figure 11 – Midship section of SPIRIT of NEW ENGLAND at 20 degrees. Stimson Marine Design

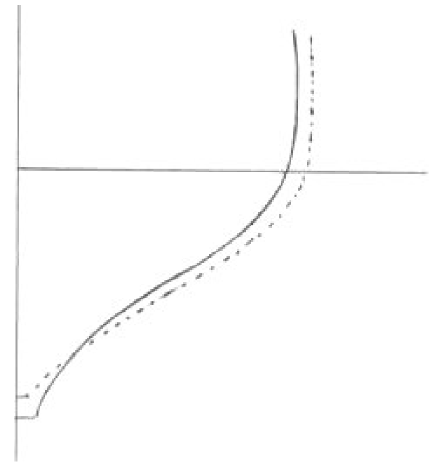


Figure 12 – Comparison of BLUENOSE (dashed line) and SPIRIT of NEW ENGLAND (solid line) midship sections. Stimson Marine Design

Sidebar- Midsections:

NOTE how SPIRIT of NEW ENGLAND is able to accommodate her ballast lower in the bilge without increasing her overall draft. Note also that she lacks the hardness of bilge that BLUENOSE possesses. We felt that a slacker bilge would give the schooner a seakindlier motion, which is important in her life as a combination of yacht and sail training vessel.

Sidebar- Diagonals: (Refer to Figures 2 & 3)

When comparing the lines of two vessels, the diagonals are often the most telling, giving a truer picture of what the water "sees" as it flows across the hull's surface. Waterlines and buttocks may have sharp curves at either end without ill effect on speed, but the diagonals must be easy, sweeping curves. If the diagonals are relatively straight, resistance from wave-making will be minimized. The diagonals on SPIRIT of NEW ENGLAND are much straighter than those on BLUENOSE, indicating a hull that is more easily driven as she nears hull speed.

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ABOUT THE AUTHOR

David Stimson is general manager of Boothbay Harbor Shipyard in Boothbay Harbor, Maine. He grew up on Cape Cod, Massachusetts, and first began working there in local boatyards in 1969. His mentor for boatbuilding and design was a neighbor, Merton Long, a Maine boatbuilder who was transplanted to the Cape in the early 1900s. Pete Culler of Hyannis, MA, and John Gardner of Mystic, CT, also had an early influence on his boatbuilding philosophy, which favors simplicity in design and construction, along with artistry of hull form and rig design. For more than 30 years, Stimson has been designing, building and restoring traditional wooden vessels, from small skiffs and kayaks to the 60' Gannon & Benjamin schooner REBECCA. His design office, Stimson Marine Design, is located at the shipyard.

APPENDIX
Table of Comparison of Schooner Designs. Compiled by Stimson Marine Design.

Vessel	LOA	LWL	Beam	Draft	Displ Long tons	Sail Area (4 lowers)	Least Freeboard	Lead
Bluenose	143'	112'	27'	15'-10"	280	7672	4'-4"	4'
Columbia	141'-3"	110'	25'-8"	15'-8"	264	7186	2'-11"	2'-3"
Henry Ford	139'	109'	25'-6"	15'-7"	253	7612	3'-10"	3'-3"
Puritan	139'	105'	25'-7"	14'-9"	210	7259	3'-4"	0
Gertrude Thebaud	132'-7"	103'-3"	25'	16'	250	6482	2'-10"	5'-3"
Spirit of New England	144'	112'	25'-6"	15'-10"	255	7723	4'-6"	0'-6"

This table was generated mostly from small-scale drawings; therefore the dimensions may be off by a few inches and some of the displacement figures could be off by 5% or so. The figures for BLUENOSE are accurate, as are the numbers for SPIRIT of NEW ENGLAND.

It can be seen that BLUENOSE is considerably longer, beamier, heavier, and more heavily canvassed than any of her adversaries, which undoubtedly gave her a great advantage. A look at the numbers for SPIRIT of NEW ENGLAND ought to make the BLUENOSE IV feel a bit nervous.

Of particular interest to me is the wide variation in lead in the vessels. Lead (pronounced "leed") is the longitudinal distance between the Center of Effort (CE) of the sail plan and the Center of Lateral Resistance (CLR) of the hull. Usually the CE is placed somewhat forward of the CLR. One would think that this would give lee helm, but dynamic forces such as the pressure of the lee bow wave tend to generate weather helm in most hull forms while sailing. To compensate, the CE is moved forward. The GERTRUDE THEBAUD was reported to have some lee helm in certain conditions. The fact that she has the greatest lead – 5'-3" – on the shortest waterline length would seem to explain why.

PURITAN may have been the fastest of them all when reaching and when sailing to windward in moderate conditions. Her displacement was extremely light at 210 tons, yet she carried almost as much sail as BLUENOSE. It is doubtful that she could have stood up to windward the way BLUENOSE did in heavy going, though.

The sail area given for HENRY FORD is from the original measurements. Before the races, the official measurer decreed that the mainsail was too big for the vessel's waterline length according to the rules, and the sail was reduced by a few hundred square feet. Had she been allowed to carry the original mainsail, the FORD might have brought the cup home. As it was, she beat BLUENOSE in two races that were subsequently thrown out on technicalities.

The Influence of Working Craft on Post World War I Wooden Yachts of the Pacific Northwest

Laura Hoenemeyer
Northwest School of Wooden Boatbuilding

ABSTRACT

First explored by Lieutenant Peter Puget in 1791, the waterways of the dramatic northern Pacific coast are steeped in over 200 years of maritime history. Seattle, founded in 1851, the first major city in the Puget Sound area, successfully supported its growing metropolis through an intrinsic reliance on the area's natural resources. Working vessels from tugs to schooners to shallop fleets helped to harvest and transport the copious amount of salmon and timber that fueled the economy.

The advent of the First World War saw American ports and shipwrights called into the War effort and the young Pacific Northwest was no exception. In 1918, H.C Hanson of Bellingham, WA became the West Coast supervisor of all Navy projects, and Norm Blanchard was a superintendent of deck installation at Skinner & Eddy. After the War, Hanson and Blanchard, along with fellow Northwest designers Ted Geary and L.H. Coolidge, reveled in the booming economy. A stage was set with both the means and the clients to design and build the menagerie of capable working and pleasure craft that still traipse the rugged waters of the Northwest.

The backbone of my paper will be in the Columbia River Gillnetter. The findings from a careful study of the lines and construction plans for this boat will serve as a 'Northwest ideal' with which I will compare later yachts, the idea being that what creates a strong and seaworthy vessel at 20 feet will hold true for craft of different lengths and, whether intentional or not, similar proportions are to be found in the motor cruisers that were designed for efficient, safe, and sporty function on the Pacific Coast.

In addition, the social environment and state of regional affairs during the time of design are just as important to the yachts as the designs themselves. To that end, I will provide an accounting of Seattle's marine trades at the time of construction as well as biographical information on the designers. I wish to create a lively history focused on the design and construction techniques of post- World War I yachts and bring to life the roots and art of boatbuilding in the Pacific Northwest.

PACIFIC NORTHWEST ROOTS

The jagged coastline and cruising grounds of the Pacific Northwest, explored by Captain George Vancouver in 1792, is the product of hundreds of thousands of years of glacial ice carving valleys through numerous cycles of advance and retreat. Following British orders, Vancouver's fleet of the CHATHAM and the DISCOVERY were commanded to find the Strait of Juan de Fuca and chart the Puget Sound. Small pulling boats were sent on week-long charting expeditions. In one month, Vancouver and his men mapped the entirety of the Puget Sound coastline by taking compass bearings of significant landmasses, drawing sketches, and noting sun observations.

The wooden boats had ten rowing stations, a sprit rig, and space in the foc'sle for supplies. Reliable and seaworthy, these boats were able to successfully navigate a coastline in seas that "at most locations, whether or not the wind is blowing, several groups of waves with different heights, periods, and directions travel pass one's observation point simultaneously."

The beaches where the men camped are small and rock strewn. Currently, only 32% of Puget Sound beaches have a backshore and the landward limit of these beaches is typically marked by a large cliff or man-made boundary such as a sea wall.

The Puget Sound basin, surrounded by the Olympic and Cascade mountain ranges, holds "innumerable pleasing landscapes" but falls victim to its notoriously damp weather due to wet air masses that move East across the Pacific Ocean and drop precipitation as they pass over the Olympics, regain moisture as they cross the Sound, and then create more rain or snow over the Cascades. This process of orthographic lifting that produces so much precipitation makes possible what Vancouver describes as,

> "The abundant fertility that unassisted nature puts forth, and requires only to be enriched by the industry of man with villages, mansions, cottages, and other buildings, to render it the most lovely country that can be imagined."

The Puget Sound area certainly relied on the plentiful natural resources to grow as an international port and metropolis. While most coastal cities have wooden boat communities, Seattle's geography fostered an entire city of wooden boat enthusiasts; citizens who have relied on many different kinds of functional and beautiful boats for both enjoyment, and out of necessity, from the beginnings of the city.

Growth of Seattle

Men who had tried their luck in California as well as parties traveling from the East coast first settled Seattle in the 1850s. King County was formed in 1852 and chose Seattle as the county seat of all legislation. That same year, county commissioners were named, and a post office was established. In 1853 the county had a population of 170 settlers. Initial industrial momentum was hindered by its geographic isolation and lack of a railroad. Seattle, surrounded by glacial mountain ranges, had poor farmland that could not easily sustain the settlers. Fortunately, the natural resources of timber, coal, fish, and other seafood were plentifully available to both feed the residents and foster trade in the first years of settlement. The disadvantages of Seattle's location were met with the ingenuity and determined spirit of her settlers and early government leaders. This allowed the natural resources to fuel Seattle's economic growth.

The Seattle Coal Company

Coal became Seattle's first large industry. The Seattle Coal Company would transport the product on barges across Lake Washington and Lake Union and then by small rail engines to the Pike Street bunkers on Elliott Bay. This process supplied employment, and created a busy waterfront. In 1875, there were approximately 60 men working in the mines, and 15 men working the transportation at a rate that produced 100 tons of coal a day.

The Seattle Coal Company grew steadily, along with the Seattle and Walla Walla railroad that was soon running four engines and fifty coal cars that could transport 400 to 800 tons of coal a day, as well as carrying mail and passengers.

Logging in the Puget Sound

More employment was found in the lumber industry. At the end of the 19th Century, one-eighth of the country's standing timber was found in Washington. The majority of that lumber, including Douglas fir, cedar, spruce, and hemlock was all found in Western Washington. With little to no government regulations, the logging industry boomed in the hillsides of the Puget Sound.

It was, then, a result of the natural marriage between the riches of the forests and their proximity to waterways that large lumber schooners were built up and down the West coast to help transport the timber. Schooners like the WAWONA, at LWL 165-feet, beam 35-feet, one of the largest three masted schooners built in North America was known for her fast deliveries of cargo and swift returns. Built in 1897, with a double hull construction at the yard of Hans Ditley Bendixsen of Fairhaven, CA, she was purchased by the Dolbeer & Carson Lumber Company.

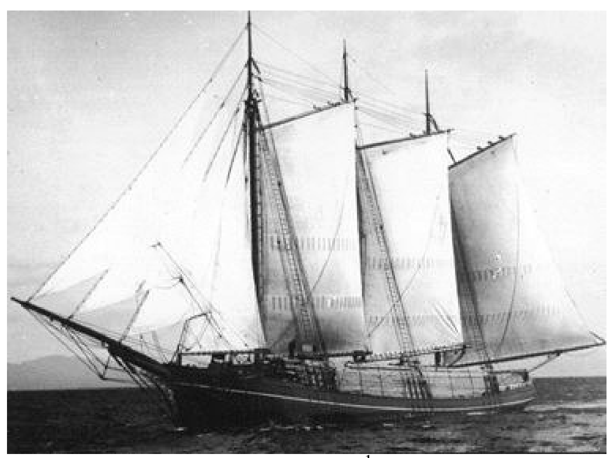

Figure - 1 WAWONA under sail.[1]

She spent seventeen years running logs until being bought by Robinson Fisheries in Anacortes, WA where she began a career in commercial cod fishing. As the base of operations for eighteen dories, the WAWONA and her thirty-six men crew would spend six months trolling for

[1] Source www.seanet.com/~morgan/graphics/wawona

Pacific Cod along the Aleutian Islands in Alaska. Surpassing all other Pacific schooners, the WAWONA has a lifetime catch of 7.2 million cod.

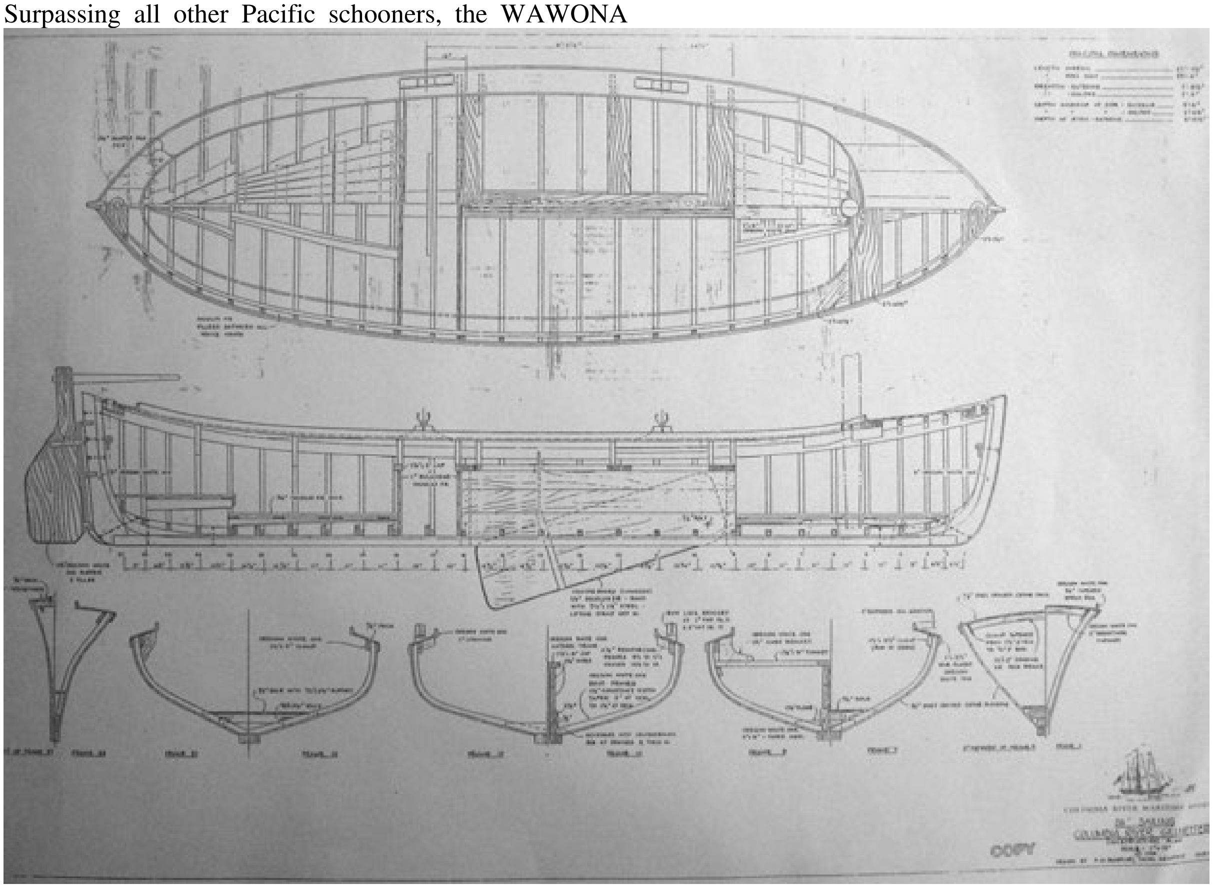

Figure 2 - Construction plan of Columbia River Gillnet Boat. Courtesy Columbia River Maritime Museum

COLUMBIA RIVER GILLNET BOAT (Figure 2)

While schooners were used in some of the fisheries, smaller vessels were typically found doing most of the work for the salmon catch. The Columbia River Gillnet boat was first designed by J.J. Griffin in 1868 to replace the Whitehalls that were being used by fishermen on the Sacramento River. Originally 22 feet LOA, the design grew to 28 feet as her popularity increased. Plans from the Columbia River Maritime Museum call for a boat that is 27 feet LOA, with a LWL of 25 feet, 6inches. The maximum beam was 7 feet, 8 inches.

The Columbia River boats were commonly purchased in dozens by canneries along the Pacific coast that would lease the boats to fisherman under the terms that they sold their catch back to the cannery. While an 1872 design change calling for washboards and fore and aft decking raised the price from $220 to $240, these boats were efficiently built for about fifteen years of heavy usage. By the 1880s they were the standard for fisherman from San Francisco to Bristol Bay, Alaska.

Beamy and full ended, with moderate deadrise throughout, these boats are stable, seaworthy, and maneuverable for their short-handed crew of two to three men. The bow had a slight rake with high flared sides. The beam increased until the aft oarlock at which point the boat had a very sharp, almost a right angle, turn of the bilge. The turn quickly softens heading farther back and by the stern the hull had regained a considerable amount of flare.

Often sailing in heavy weather with a boat full of fish and gear, they carried a centerboard and a sprit rig with a jib often tacked to the stemhead.

The boats were stock built from locally grown materials and fastened with galvanized steel bolts and nails. All of the rigging hardware, including belay pins, halyard cleats, and oarlocks were made of galvanized steel as well. Frames were steam bent onto molds and later placed and fastened on the boat cold. Planking was ¾-inch Port Orford Cedar.

Materials and Scantlings- Columbia River Gillnet Boat

Port Orford Cedar	Douglas Fir	Oregon White Oak
3/4" Planking	3/4" Sole	3" x 9" Keel
7/8" Decking	1" Bulkheads	3" wide Stem and Sternpost
	1-1/2" x 2" Deck beams	1-1/2" wide Frames
	Centerboard	1 1/2" x 3 1/2" Clamp
	Sheerline blocking	2" Breasthook
		1" Coaming
		Centerboard Trunk
		Thwarts
		Rudder & Tiller

The stark design has the ability to prevail through a multitude of stresses. The boats were rowed hard into the weather, loaded down with thousands of pounds of fish and gear, and were purchased by canneries with the expectation that they did not require maintenance. In rough seas and with full holds, they still maintained their maneuverability and seaworthiness. The design is one of the first conduits into the Northwest ideals of boatbuilding. Sturdily built with local materials, these shapely and practical boats aptly handled their local weather conditions.

Columbia River Gillnetter Rig

Sail Area	278 sq. ft., plans allow for one reef
Mast	22' tall, tapered from 5-1/2" to 4-1/2"
Sprit	21' long, tapered 3" to 2"
Boom	23' 6"long, tapered 3-1/2" to 2-1/2"

The Gillnetter has a small sail for a boat of her size. Even for a working boat, the design is quite beamy for its length, as well as heavy in materials. In the interest of reaching the fishing grounds, going to weather was counter-intuitive. With strong men to row into the wind, the sails were then only used for a down-wind course.

The smaller sail area can also be justified by taking a look at the Beaufort scale and the prevailing sea state. Sailing in a 'fresh breeze,' categorized as a 5 on the Beaufort scale, where winds can reach between 16- 21 knots, anywhere from 417 to 695 pounds of pressure would be exerted on the sail. The fishermen also sailed in weather rated at a 'gale.' With winds between 28-33 knots, 1112 to 1668 pounds of pressure were placed on the gillnetter rig. The sails were large enough to propel, yet not overwhelm the crew and vessel.

With two to three thousand pounds of fish on board, the crew was adept at working with what they had and there was no need to fuss with a larger rig. On a good fishing day, these boats would have a few inches of freeboard, caused by their heavy catch. This extra weight took the boat off its lines and while it was still maneuverable, in the case of a gust correction could be taxing on both the homeward course and the strength of the men. With fast moving and unpredictable weather of the Northwest, the row of reef hooks on the sail plan suggests that there was still the need to shorten the already small sails.

At other times they rigged an additional, slightly smaller, sail off the mast that had its own boom and sprit. Not the traditional wing-on-wing, they also set their jib with the two mains. When conditions allowed, this effectively doubled their sail area, and helped them reach port quickly. The Gillnet rig, with its multiple arrangements, was properly suited for the job, was aptly handled by the crew, and provided the fishing fleets with a look all their own.

Figure 3 A - Gillnet boat under sail.[2]

MOVING INTO THE 20TH CENTURY

On November 11th, 1889, Washington was granted statehood. By 1893 the first Great Northern Railroad train crossed the Cascades and stopped in Seattle. Now connected by land, it was time to establish Seattle as a worldwide port.

Along with numerous shipyards, mill yards, and machinists, the Seattle 'mosquito fleet' was growing. This menagerie of both steam and sailing craft that served as taxis along Elliott Bay, as well as on Lake Washington in between Bellevue, Mercer Island, and Northeast Seattle, was increasingly vital to the daily lives of Seattle citizens and visitors. Many of these

[2] Source: www.historicfishing.net(1939_maknek_river_ragnar_norgaard_nils_norgaard_tallyman.thumb.jpg)

early ferries would meet passengers at the terminus of rail and trolley lines to make land and water inner-city travel easy and efficient.

Next on the docket was a ship canal and lock system that would join Lake Union and Lake Washington to the Puget Sound. The Lake Washington Canal Association would face decades of setbacks following its inception in 1871. In 1908 US Congress sent a final group of engineers to make the last specifications for the $4,358,229 project. Congress passed the Rivers and Harbors Act on June 25th, 1910, and the US Army Corps of Engineers broke ground on November 10th, 1911. In that same year, Seattle created a port commission to build more terminals, public docks, and wharfs.

Seattle Liveries

The turn of the century saw Americans rejoicing in the growth and progress of their cities as well as their nation. The success brought new frivolities and leisure activities. In Seattle, one of the many enjoyments available to citizens were the liveries along Lake Washington and Lake Union. The liveries operated with small lapstrake boats and were close to cable or electric car lines. The location made the boats convenient and accessible to everyone, from real estate brokers showing waterfront property to Seattle residents sightseeing or picnicking.

Norman Blanchard Sr. began his professional boat building career at the Leschi boat shop, building these small clinker craft. Blanchard, born in Brooklyn, New York, moved to Seattle with his family in 1888, at the age of three. His apprenticeship at the Leschi shop culminated in 1905, at which point he set up shop with his friends Dean and Lloyd Johnson on the Northeast bank of the Duwamish River.

Ted Geary

Leslie Edward "Ted" Geary was two years old when his family moved from Atchinson, Kansas to Portland, Oregon. In 1892, his family moved to Seattle. At the age of fourteen, Geary built his first boat, a 24 foot centerboard racing sloop. With his childhood friend Lloyd Johnson, Geary circumnavigated Seattle on a 16 foot sailing canoe of his own design in two days.

While completing his engineering degree from the University of Washington, Geary found success racing his own designs. His most accomplished vessel at that time was SPIRIT, a 42 foot LOA, 28 foot, 7 inch LWL sloop. With the help of his crew members, Norm Blanchard among them, he won a three race series against the Canadians for the Dunsmuir Cup. Helping to fuel a healthy competition with the Canadians, Geary enjoyed a fine reputation as a designer and skipper, so much so that a group of prominent Seattle businessmen funded his MIT education.

In 1910, Geary returned to Seattle to continue his yacht design career. Blanchard was friends with Geary, and they were both friends with the Johnson brothers. Together they began designing and building boats for wealthy Seattle clients.

The typical Geary design coming out of the Blanchard shop at this time was around 100 feet on the waterline with dramatic formal appointments. Even at such long waterlines, these boats kept with the Northwest aesthetic with a high slightly raked bow and fantail stern to provide everyone from dinner guests to crewmembers with a seamless ride through unpredictable weather.

Geary would go on to design dozens of large cruisers in a career that would eventually take him to Hollywood designing for movie stars and celebrities. But it was his grossly underbid semi-diesel coastal freighter that would sink the Blanchard and Johnson Brothers yard in 1915. During the construction, the Johnsons fled to Vancouver, leaving Blanchard to complete the ship, after which he joined the war effort at Skinner & Eddy.

WORLD WAR ONE

Seattle was home to 250,000 people on the July 4th, 1917 dedication of the Lake Washington Ship Canal. The dedication came seven months after the US entered the Great War, and an estimated 40,000 men were hard at work in the Seattle shipyards building naval warcraft. Blanchard worked at Skinner & Eddy as a foreman of deck equipment installation. Considered the largest of the Seattle yards, Skinner & Eddy completed and delivered 75 ships before the war's end. Another shipyard, Meacham and Babcock Shipbuilding Company, had a US government contract to construct twelve wooden hulled freighters. The yard launched their first boat in May 1918 and their last 3500-ton capacity freighter in October of 1919.

Seattle marine trades transformed to focus on the war effort. The City played a major role in producing ships for the country and civilian life was altered as well. The County purchased ferries to help shipwrights get to the yards and a sixty-mile boulevard was paved around Lake Washington to help people get into the city. Among other reallocation of goods, Washington state supplied most of the spruce used in making airplanes.

H.C. HANSON

The prolific Northwest designer Harold Cornelius (H.C.) Hanson, having apprenticed under his father, a superintendent for the Pacific American Fisheries, started his career during the war. He was the chief inspector of the Puget Sound shipyards for the country's Emergency Fleet Corporation. He also taught classes in Tacoma, WA to educate young shipwrights for the war effort.

At 23, Hanson was the chief draftsman for a fleet of schooners for the Australian government with Heath Shipyards in Portland, Oregon. Clearly a multi-talented and respected man, Hanson continued to work for the government until 1922 when he went into business for himself designing commercial fish boats and tugs. During his career, Hanson created upwards of 3,000 designs resulting in approximately 16,000 pleasure and commercial boats and ships built to his specifications.

H.C. Hanson's 30-Foot Gillnet Boat (Figure 4)

Hanson's 30-foot Gillnet boat is a direct descendant of the Columbia River Gillnet boat. The 1941 drafting of this boat speaks to the irrelevance of time on seaworthy vessels as well as the instincts of Northwest designers who knew not of trends, but rather tried and true hull shapes that safely carried catch and crew. The profile is essentially the same as her predecessor, with a fine high bow, and double-ended hull. The high bow provided excellent tracking to and from the fishing grounds while the fuller body aft and double ended stern made the boat comfortable in the seas while fishing. The 5-foot wide pilot house sits amidship, with two feet of decking on either side. The 4-foot long cockpit was enough space to work the gear; the fish holds were below deck, in between the cockpit and house. From the pilothouse there were stairs leading down to the galley and twin v-berths. Accommodations were sparse but purposeful.

The materials list is simple: unless otherwise specified, the lumber was to be sap free, clear grain Douglas fir. White oak was used for the frames and ironbark was used for the bug shoe and the rubrail. All of the hardware was galvanized steel, and the caulking was cotton except under the waterline where cement was used. The construction of the boat was sturdy and practical; time was spent to use tongue and groove ¾-inch decking that was later covered with tar and felt. Tongue and groove joinery was also used on the ½-inch ceiling. The pilothouse had plenty of room and windows to give the captain a functional perch to drive the boat well in any condition.

POST-WAR BOAT BUILDING

In 1919, Blanchard used his savings to found the N.J Blanchard Boat Company on Lake Union. With Geary, he continued to build 90 to 120-foot motor yachts through the early 1920s. They were first class yachts with spacious rosewood interiors and all amenities found on land. These lavishly appointed vessels were built for oil and lumber magnates for which money was no object and while they kept the shop busy they limited it to an exceedingly small clientele.

In 1923, when Blanchard refused Geary's request for a sales commission, their professional partnership ended. Geary took his work to the Lake Union Dry Dock and Blanchard began collaborating with Leigh Coolidge on a new design. Blanchard decided to move away from the large yachts that he was building with Geary. It was the 1920s, the war was won, and American citizens were looking to have a good time. For the typical household in the Pacific Northwest that meant being outside and on the water enjoying the expansive seascapes.

With the goal of providing an accessible and convenient boat for the masses, Blanchard and Coolidge designed a standardized raised-deck cruiser with large foredecks and large cockpit pilot houses. The Blanchard yard would build twenty-five of these boats between 1924 and 1930 that cruised the countless waterways of the Puget Sound, as well as points north and south, with style and speed.

COOLIDGE'S 36- FOOT CRUISER

Materials and Construction

It was not possible to find specifications or a construction plan for the 36-foot cruiser. However, a materials list and construction plan does exist for the 1925 Coolidge design Number 541, a 50 foot power cruiser named KIYI. Due to the closeness in size and design, it is safe to say the materials list and construction is similar to that of the smaller cruisers.

Materials and Scantlings

Douglas Fir	**Port Orford Cedar**	**Teak**
Keel	Planking	Pilot house
Knees-natural crook	Ceiling	Companionway
Shaft logs	**White Oak**	**Spruce**
Stern post	Frames	Dinghy Rig
Floor Timbers	**Spotted Gum:**	**Other**
Bilge Stringers	Stem	Ironbark- Shoe
Clamp & Shelf	Horn Timber	
Floors	Deadwood	
Deck Beams		

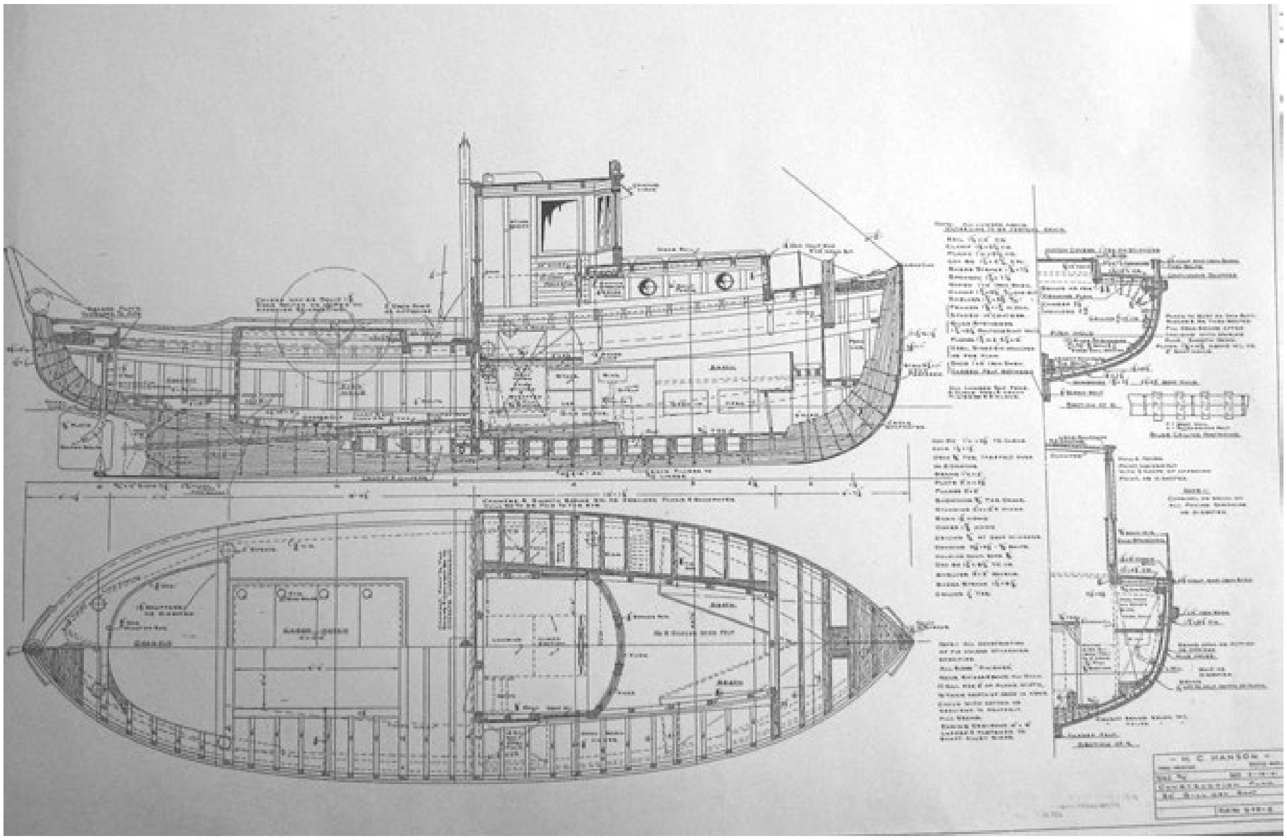

Figure 4 - Hanson's 30-foot Gillnetter construction plan. Courtesy H.C. Hanson Naval Architecture Collection, Whatcom County Museum

Backbone Construction

The ship was to be properly lofted and the molds were taken off of the lines to the inside of the frame. The clamps and stringers were then let into the molds and ribbands were faired the length of the hull before framing began. Coolidge called for the workmanship to be "strictly first class throughout."

The stem, horn timber, and deadwood were to be made from the dense hardwood, spotted gum. The wood is relatively easy to work, which is crucial for chopping a rabbet, and the straight grain responds well to steam bending. One substitute for spotted gum could be purple heart and Coolidge makes the note that another suitable hardwood could be used if necessary. Copper paint was to cover and protect all surfaces of the deadwood and stem.

The American white oak frames were steam bent to the outside of the ribbands and had corresponding floor timber to which they were attached with ¼-inch galvanized steel bolts. The floor timbers were given 1-inch limber holes to allow for the flow through of water. The exceptions were the engine room bulkheads that were fitted with gaskets and made watertight. It was also noted in the plans to take care in lining up the frames with the bulkheads as to ensure they were as watertight as possible.

The decision to use white oak for the frames is common as the wood has a straight open grain that allows for fairly easy steam bending and has an excellent resistance to wear and decay. White oak was used in both of the previously mentioned gillnet boats and continues to be an accessible and reliable choice for framing stock.

The keel, shaft logs, sternpost, and bilge stringers were constructed of Douglas fir. The straight grained wood is easy to work, holds fasteners well, and resists sagging and warping over long lengths. These qualities were amplified by the use of the Northwest stock, which is known for its superior toughness and strength. Coolidge protects the keel by requiring both the keel and the ¾-inch ironbark bug shoe to be thoroughly covered with copper paint.

Clamp and Shelf

The clamps were to be worked in two lengths "with scarf not less than 40 inchs long or, fastened with an anchor stock piece about 7 feet long." The shelf was 1-inch thick by 5 inches wide and fastened to the frames with one 5/16 inch nut bolt at each frame.

Planking

Port Orford cedar was used for the planking. Locally grown in Northern California and Oregon, it has a straight and even grain with adequate bending strength and is highly resistant to decay. The boards were to be edge-set as little as possible and backed out where needed, especially at the turn of the bilge and tuck. Edge-setting is a fantastic way to get the most out of a lumber order but over time can cause the hull to foul and lose shape. This specification shows Coolidge's commitment to a long lasting and reliable product.

When butts were necessary, butt blocks were made, the thickness of the planking and fastened with ¼-inch galvanized bolts. The ribbands were to be left on as long as deemed practical during the planking process to ensure a hull true to its lines.

Deckbeams and House

The fir deck beams were to be sawn and finished so that the canvas laid smoothly on top. A heavy coat of pine tar and linseed oil was applied to the wood before laying the canvas to deter the trapping of moisture and creation of rot. The canvas decking was laid under the covering board and fastened with well burnished sheet lead tacking strips.

A reccurring attention to detail was the specification that all knees in the ship were to be natural crook. A superior product to sawn or half-lapped knees, these natural crooks are currently difficult to find but provide arguably the strongest and most beautiful reinforcement.

The entire house, doors included, is made of teak. Always popular, yet increasingly more expensive, this exceedingly durable wood becomes more beautiful with time.

Arrangement (Figure 5)

Allowing the materials to remain constant between the two designs, Coolidge's 36- foot cruiser was ready for anything from idyllic day trips with friends to blustery days below deck between ports of call.

The arrangements are spartan; a curtain separates the forward twin v-berths from the galley, lavatory, and living quarters. A collapsible table sits on the centerline amidships with a berth on either side. Steps lead up to the pilot house and aft to the 11-foot cockpit.

The amenities below deck are sacrificed for the ample outdoor space. It seems the most comfortable place for a passenger would be in the cockpit. While the boat is certainly capable of long cruises, for larger parties it was most enjoyed on shorter trips.

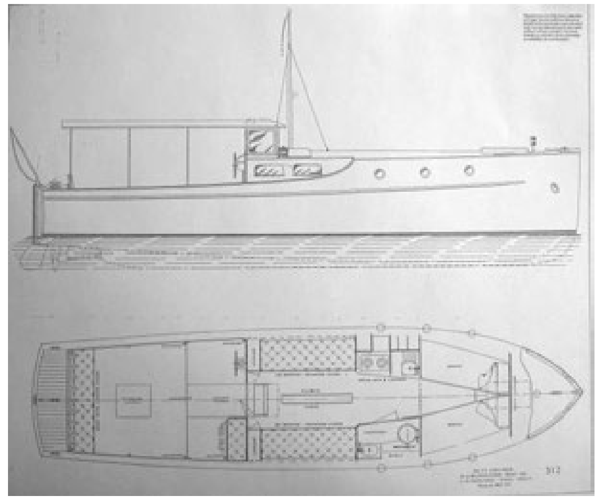

Figure 5 - Arrangement plan of the Coolidge 36-foot cruiser. Courtesy Museum History and Agriculture Seattle, WA.

Downfalls of the design also include the limited visibility below deck. The pilot house is small and not fully enclosed so if the weather did turn it would not be enjoyable.

Even though the accommodations stray from the working boats before it, the high fine bow remains and the hull looses its flare as the hull continues to widen moving aft. This allows the bow to cut through the water and be pushed aside to offer the five the passengers a smooth ride.

H.C. HANSON'S STANDARDIZED CRUISER

Coolidge's design was the region's first venture into an 'everyman's yacht.' Two years later, in 1926, Hanson penned his bridgedeck cruiser design. While it shares the same waterline length, Hanson's design hardly departs from its working class roots. (Figure 6)

Where Coolidge allows for an 11-foot cockpit with plenty of seating, Hanson's boat has only a 4 foot long cockpit. It is the same size as his gillnetter except in the place of fish gear lies a seat with two 50 gallon water tanks underneath. Other than the small seating area the cockpit only serves as an entrance way to the main saloon rather than the social grounds for the skipper and his crew.

Another difference is the extra foot of beam on the Hanson compared to the Coolidge. The lack of cockpit, along with an extra foot of beam, allows for much more spacious accommodations below deck. The main saloon features two settee berths on either side of the vessel, a bathroom with shower, and a bureau. As you walk past the main saloon settees you enter the pilot house, with two small seats on either side that were connected by a hinged sectional. On the starboard side is the ship's wheel with stool. The 60 HP engine is located in the center of the pilot house. Dual 150 gallon fuel tanks sit on either side in the forward end of the pilot house. On the port side are two steps leading down into the galley and main sleeping quarters. The galley is efficiently designed with stove, plenty of counter space, an ice box, and sink. The twin v-berths complete the living quarters.

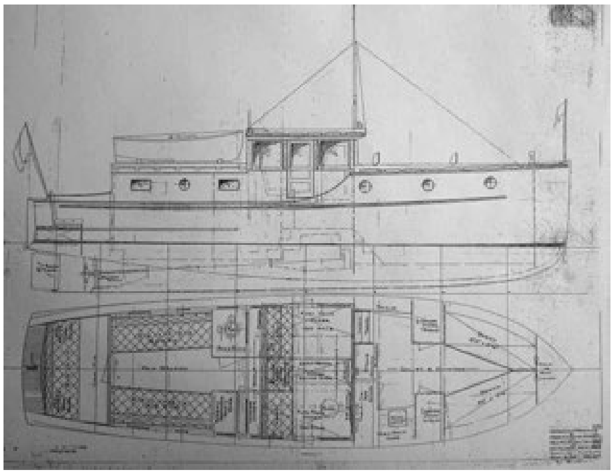

Figure 6 - Arrangement plan of the Hanson 36-foot cruiser. Courtesy Museum History and Agriculture Seattle, WA.

COMPARING THE TWO DESIGNS

Both Hanson and Coolidge designed great boats for the Pacific Northwest waters and while they are essentially the same hull design and layout their fortes were quite different.

The extra indoor space afforded to Hanson with his small cockpit, allows for a better appointed living quarters and significantly more privacy while sleeping. The bridge deck design creates a seamless indoor space that would be perfect for long cruises up the Inside Passage to Alaska. The large pilothouse is more comfortable for the skipper and the greater visibility it provides would be to his advantage in rough seas. The windows in the companionway also provide visibility to the passengers, whereas in the Coolidge design, little could be seen of the surroundings and sea state without going outside to the cockpit.

While the meticulously designed Hanson is a capable boat, it might not be the craft of choice if your intent was day trips and shorter cruises. For that sort of boating, the Coolidge would be the superior design. The ample outdoors space and simple layout below deck is perfect for entertaining friends and enjoying the beautiful weather. That is not to say the design could not hold its own in a storm of over long distances. But with a partially enclosed pilothouse, driving the boat would be wet and all other passengers would be below deck unable to see their surroundings.

As with any two well-designed, similar vessels it is hard to say which is better. With these boats, as with many others were there is no question as to the craftsmanship and construction, it is ultimately a question of personal preference.

CONCLUSION

The Columbia River Gillnet Boat set the standard for the working and pleasure craft that were built in the Northwest. Built from local materials, these boats not only bolstered the fishing industry but the logging industry as well. When Coolidge and Hanson were designing, there was still no reason to build with anything other than local materials, so their boats as well were made of locally grown timber. This created a wholly Northwest built boat.

The barebones construction of the Gillnetter progressed into clean lines, appropriately sturdy scantlings, and first-rate construction in the later designs. The earlier boats needed and received little maintenance during their 20-year lifespan, while the cruisers that received proper care and maintenance are still beautiful showpieces on Northwest waters.

Not to discount the impressive R-boats built by Geary, but the yachting tradition in the Pacific Northwest is largely focused on powerboats. Nothing can compare to the lavish 100 foot yachts built for the wealthy businessmen or the later stock cruisers. Their understated elegance is a testament to the ideals and sensibilities of their builders who above all else held function and purpose as their main design principles. Grounded in their working class roots, these Pacific Northwest yachts continue to strike a notable compromise between their tasteful good looks and rugged design.

ACKNOWLEDGEMENTS

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I BOATS
The 18-Footers:
Variation within the Rules

Philip West Mallard II
Member, Herreshoff Marine Museum

Figure 1 - SECOND WIND is a Phil Bolger interpretation of the 1903 HAYSEED.. Courtesy of Todd Sayce

INTRODUCTION

They were known as “cheaters,” and “freaks” for they pushed the Rules to the limit. They were the bane of other more wholesome one designs within a class, for even when handicapped they beat the pack too easily. If there were historic cheaters within design parameters what of the more recent CASCADE a cat-ketch that was a “rule beater"? And if this is so what of that technical marvel- at least in its time- that beat them all on their home turf or should it be said the playing ponds of Britain–the schooner yacht AMERICA…*There was no second.* Britannia ruled the waves…not if those dammed Yankees had anything to say about it. The rules of the one-design class leveled the playing field; to produce a winner within the sailing class design rules. Is it cheating or genius?

I BOAT NOTATION AND SOURCES

I BOATS are a part of sailing history. They existed, sailed and raced as a class from the close of the 19th to well past mid-20th century. This fact proves the 18 foot water-line class to be well proportioned and durable. They were fast, able and exciting boats to race.

Information on the early days of the I Boats is mostly gleaned from issues of *The Rudder*. Please refer to the Appendix for information taken from the 1903 and 1904 pages of *The Rudder*

In later years according to one source, I boats were contracted and built at Graves in the early 1920's. Later, there was a fire taking up many. The remaining I Boats went to Winthrop, then Manchester and finally ended up in Rockport.

"The stylish 18 foot boat designed by Edwin A. Boardman came on the scene in 1925. Although a small class, the Manchester 18's endured and could be found racing in Rockport as recently as the 1960s."[1]

I Boats were also known as 18 foot Knockabouts and 18-Footers. In their day a whole series of other one-design boats existed; 17 foot Knockabouts, Manchester 17's, Bar Harbor 17's, Northeast Harbor "A & B" Class, and Dark Harbor 17's. Sonder boats designed under their own rules and later still the smaller Meter and International boats were all contemporaries to the long lived "I."

Some of what follows is quoted from past dialogues with I Boat owners. This is undocumented hearsay that could easily be dismissed. But that cannot be, as these comments- from the owners- reflect a reality of experience not to be found elsewhere. *Early One-Design Boats* by Diana Eames Easterly[2] is also a great source of information. Other scattered scraps of information have been found in maritime museums, marine libraries and yacht clubs. Archival records- not much has been found specifically written or dedicated in detail to this particular open-class design in the popular press of the day. The 18-footers sailed when yachting and yacht racing was in its zenith. Other designs and yachting news competed and when found to be of greater interest supplanted 18 foot Knockabout news.

SAILING THE I BOATS

There was only one I Boat left sitting in Rockport Harbor when I first viewed her. Her hull was painted green and she had a mast that was hooked at its tip. Working with the harbormaster at the time, I inquired after her. Later, I tracked down her owner Mr. James Chambers. He related it (the hook) was so to get more sail up higher. That particular I Boat-- NIPPER**-** was the last of the six at Rockport, Massachusetts. In time she would be sent to the Museum of Yachting in Newport R.I. Mary Ann Heath's I- LIMPET also went there, a gift in need of restoration she stated. "I hired an 'expert' to restore my boat, he couldn't, only made it worse, then left." The shipwrights (perhaps Brorr Tamm) at Graves Boatyard in Marblehead built these I's. They were all very carefully constructed of the finest materials. Later, she stated "…there was a fire. So, I gave her to the folks in Newport." She was in dire need of restoration.

Charles Francis Adams, a helmsman for the America's Cup J's, is reputed to have sailed them; perhaps, to stay sharp or sharpen his considerable skill as a helmsman. They would sink on occasion, for they sat low in the water with very little freeboard to lessen windage. They were very well, but very lightly built. All the weight that could be sacrificed above was placed where it should be- in the keel. They were not full or fin keel sailers nor did they sport a spade rudder. They were a might tender, required your full attention, and if you buried the rail too deeply you sank, quickly.

Rockport's I boats were special. The former owner of HER MINK nee PEGGY related "…she'd plane for me when I singlehanded her". Interesting remark about a cheater with tremendous overhang, cotton duck sails, and a keel large by the standards of today's designs.

To this experience Mary Ann Heath adds: "Their hulls were so finely built they would twist and bend. They would wriggle like a fish in the water. Each one was a little different from the other. We didn't win all the time. No one did. We each won our share. While all of the boats at Rockport were different no one was that much better than the others." They were in their time all Hot Rod Sailboats.

SECOND WIND- DESIGN

SECOND WIND (Figure 1) is not an original I, but built to refined I lines. The last of her breed sailing these waters, she survives, sails and still wins. "The only ones that give me any trouble are the International One-Design at Corinthian," so stated Todd Sayce to me one day on the water. She isn't built to an original Boardman I design; a might "touchy," very sweet to sail, because even on a zephyr she goes. Her heritage is very evident.

Built from parts of an I Boat found nearby, her rudder, keel ballast, king plank, mast and boom were recycled.

[1] Manchester Yacht Club- Sept. 2007 *Racing News*
[2] Easterly, Diana Eames, *Early One-Design Boats*

Research showed plans for these Boardman I designs no longer existed. Plans of a Small Bros. 1903 design

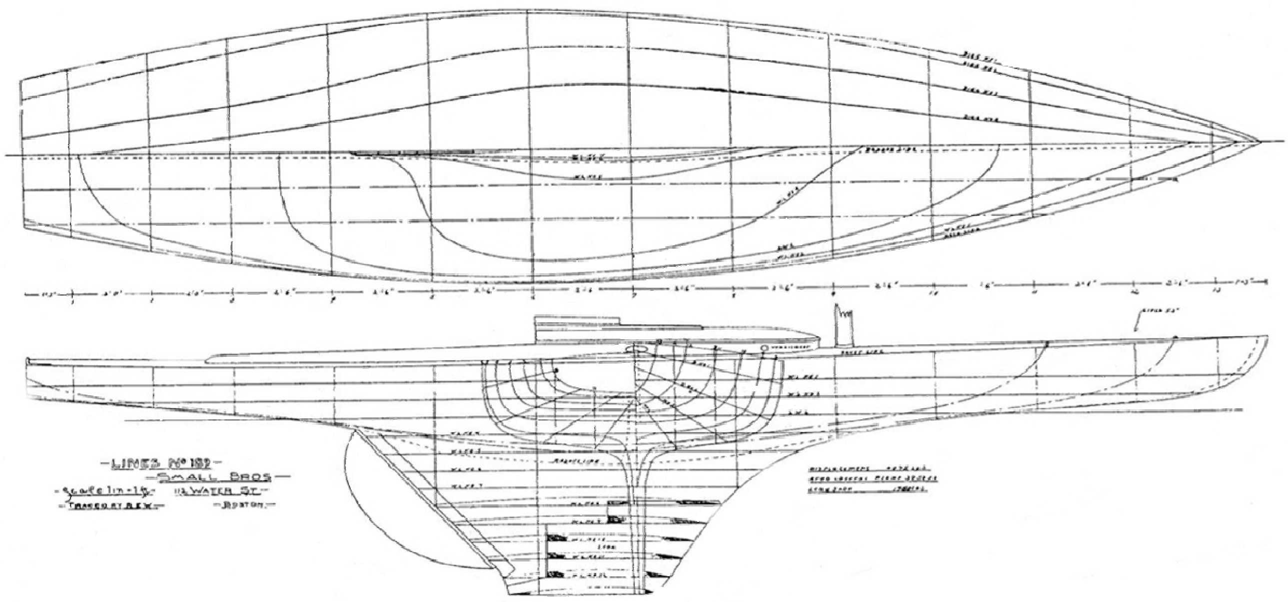


Figure 2 - Lines for an 18' Knockabout I BOAT HAYSEED. *The Rudder,* 1903, page 379

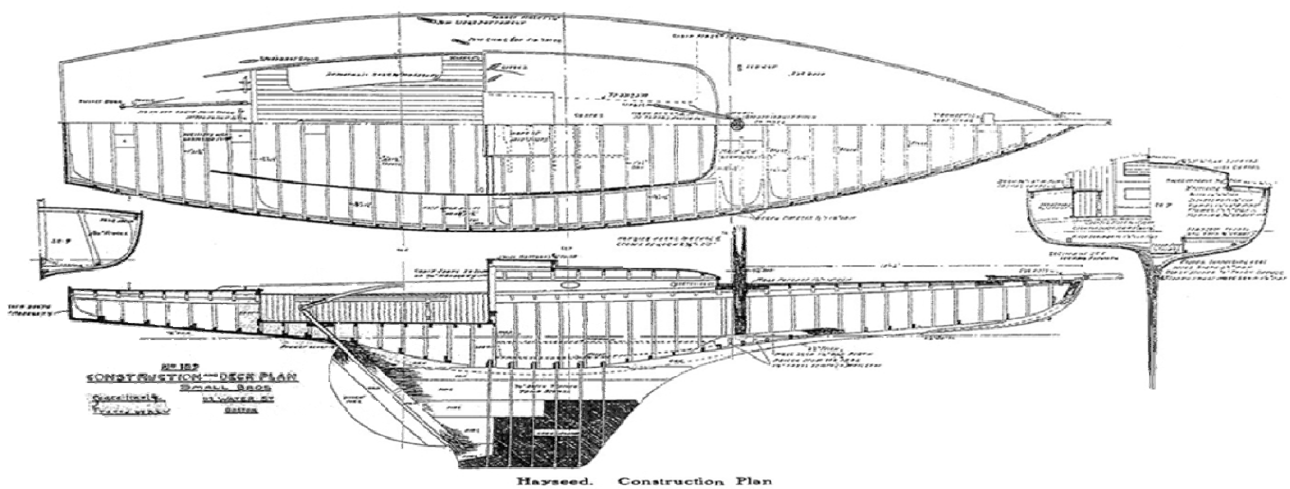
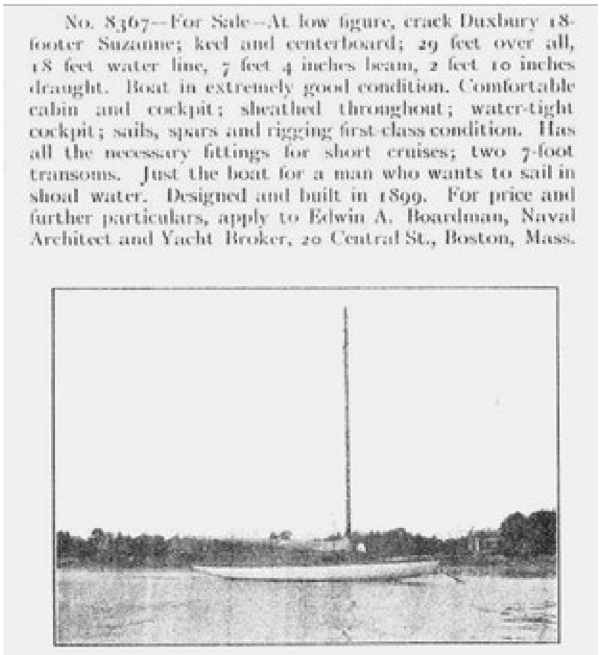


Figure 3 - Hull plan for **HAYSEED.** *The Rudder* 1903, page 379

HAYSEED were utilized. (Figures 2 and 3) "Phil Bolger helped; he took the lines we found in *The Rudder* and set them up so we could build a new hull." Montgomery's Boat Yard of Gloucester built the hull. (Photos taken during construction are in the later Section: SECOND WIND- CONSTRUCTION.) Phil Bolger's legendary design expertise succeeded in marrying the parts salvaged with the new hull allowing us to witness a rebirth. In this effort he was a remarkable midwife. At 80 he is still active in boat design.

EVOLUTION: 18 FOOT KNOCKABOUT RULES

The 18 foot (waterline) Knockabout is said to be the smaller version of a class originated at Duxbury MA. There is evidence 18-footers existed in Duxbury racing before the turn of the 19th century. Duxbury 18s were different from their more northern cousins, as they were centerboarders. This was due no doubt to the fact Duxbury waters were shoal and a full 5 foot keel of the Marblehead breed would inevitably run aground. (Figure 4)



No. 8367—For Sale—At low figure, crack Duxbury 18-footer Suzanne; keel and centerboard; 29 feet over all, 18 feet water line, 7 feet 4 inches beam, 2 feet 10 inches draught. Boat in extremely good condition. Comfortable cabin and cockpit; sheathed throughout; water-tight cockpit; sails, spars and rigging first-class condition. Has all the necessary fittings for short cruises; two 7-foot transoms. Just the boat for a man who wants to sail in shoal water. Designed and built in 1899. For price and further particulars, apply to Edwin A. Boardman, Naval Architect and Yacht Broker, 20 Central St., Boston, Mass.

Figure 4 - Ad for an 18' Centerboarder built in 1899 from *The Rudder*, 1902. p171.

Matthew Murphy in *Glass Plates & Wooden Boats* devotes a whole page to the initial phases of the 18-Footer's history:[3]

"The original idea was for a one-design class--that is, a fleet of identical boats--but this was eventually abandoned. These were the early golden years of custom yacht building, and the prevailing thinking was that a strict one-design mentality, and its resulting marginalizing of designers and builders, would squelch the spirit of competition. So a set of restrictions was drawn up, and the boats of the fleet had to conform to these. Here are examples of some of the 18-Footer design parameters:

- The least freeboard was limited to 17 inches; every inch less than this required a 4-inch increase in the beam. (The minimum beam was 6 feet 1 inch for keel models and 6 feet 6 inches for centerboard ones.)
- The cabinhouse had to be at least 6 feet long, and its width 60 % of the maximum beam.
- For centerboarders, outside ballast could be no less than 1,500 pounds; for keel models, the limit was 1,800 pounds.

There were also restrictions placed on wood species to be used (for example, oak or its equivalent for frames) and the dimensions of certain structural members."

"….The Massachusetts Yacht Racing Association (YRA) quickly recognized the class and made it eligible to compete in YRA-sponsored events. In 1901, the yachting press buzzed with anticipation for the new fleet: "This is going to be the popular class among small boats,' forecast *The Rudder*. 'They are very seaworthy and are by no means slow, and for afternoon sailing they cannot be beaten…."

While the idea of a one-design fleet had been abandoned early, the explosion of such racing two decades later was peppered with designs of the basic dimensions of the 18-Foot Knockabouts. These included the Triangles, S-Boats, and Dark Harbor 17s in Massachusetts Bay, and the Sound Interclubs on Long Island Sound. The originators of the 18-Foot Knockabouts surely arrived upon a balancing point between size and functionality…"[4]

MISS MODESTY- A 1903 18 foot Knockabout

MISS MODESTY was a competitive 18 footer in 1903.

"Reporting on the 1903 season, *The Rudder* noted of the 18-Footers:

'[T]his is undeniably the best and most popular class in the Association. Nearly thirty boats were entered in the class and the number of starters in the various races was always large, and as the boats were evenly matched every race was closely contested…"[5]

Designed by B.B. Crowninshield and built by James E. Graves in Marblehead the particulars of MISS MODESTY are as follows:
LOA- 30 ft 10 in
LWL- 18 ft 0 in
Beam- 7 ft 0 in
Draft- 5 ft 4 in
SA- 450 sq ft

As Mr. Murphy notes "[MISS MODESTY]…shows, she was anything but modest… No doubt she turned on a dime and required careful attention at the helm…"[6]

Figures 5 and 6 show the pretty MISS on the ways at Graves and doing what she did best that year- beating them in a manner most immodest.

[3] Murphy, Matthew P., *Glass Plates & Wooden Boats,* Commonwealth Editions, Beverly, MA 2006. pg 58

[4] Ibid., p.58
[5] Ibid., p.60
[6] Ibid., p.60.

Figure 5 - MISS MODESTY on the ways. ©Mathew P. Murphy, *Glass Plates & Wooden Boats,*p. 61

Figure 6 - MISS MODESTY contesting a race.*The Rudder,* 1903, p. 302

Yachting and yacht racing initially was a pastime for the well to do. The growing middle class made it theirs also. This increased the popularity of boating, added to the broad spectrum of and variation of sailboats. Teens were encouraged to sail as well. With the formation of dory sailing clubs, a stepping-stone from simple sailers to more complex evolved. Mass appeal and amount of variation of hulls within classes necessitated greater rule oversight. L Francis Herreshoff in *Common Sense of Yacht Design* describes the rule/design dynamics in-place at this time. He notes that Seawanhaka Corinthian Rules bred extreme machines; this necessitated the need to refine, or if necessary rewrite the rules for more evenly matched classes to be on a scale encompassing those waters beyond Massachusetts:

The Universal Rule

"In about the year 1902 the New York Yacht Club determined to make up a rule which would develop a more desirable type of yacht than had been developed under the Seawanhaka and ***other various L.W.L. rules***, [Emphasis by author] so they formed a committee to investigate the matter. One of the first moves of this committee was to send letters to the most prominent yacht designers in Great Britain, Australia, Canada, Denmark, France, Germany, Norway, Sweden and The United States asking for suggestions or formulas which in these designers' opinions would develop a wholesome type of yacht. The response was voluminous, but the committee adopted the rule suggested by N.G. Herreshoff which in its first simple formula was length multiplied by the square root of the sail area, divided by the cube root of the displacement. This rule, in my father's mind, was to play displacement, or room below waterline, against the sail area or driving power. You see, the cube root of displacement was the divisor, so if the displacement were large the rating would be small. But to bring the result of these measurements to a figure to be used for R, or rating, it was necessary to divide this sum by a constant. That was done by using eighteen per cent of the product, so the rule could be expressed in formula as:

$$R = 0.18\frac{L \times \sqrt{SA}}{\sqrt[3]{D}}$$

By about 1906 this rule was adopted by most of the larger Yacht Clubs in the United States and was called the Universal Rule, so that it was in general use over here before the International Yacht Racing Union was even formed and antedates The International or Meter Boats by several years. [Ed. The Internationasl Rule was developed in 1896. Most of the work was done by R.E, Froude.] It is no exaggeration to say that with the adoption of the Universal Rule the type of yacht built was a vast improvement, and I am quite sure the sailor will join me in saying they were finer than any others ever built anywhere under any rules."[7]

Knockabout 18s had their *own* of rules, but this wider, more generally applicable rule was in the offing. In time, the effect of this Universal Rule when adopted would become obvious. While still in the offing and the larger, more learned audience was deliberating on this needed oversight for the sake of fair play, its looming prospect did cause concern for the established 18's future. Given the time frame it was obvious The New York Yacht Club's inquiry had a "drugging effect" on the 18-Foot Knockabouts. For while *Rudder* notes in 1901 that "…it is an exciting class and will definitely be popular."; in the 1905 racing season- when HAYSEED won for a second year in succession- *The Rudder* wrote, before the "new rule" and its ultimate effect on this established class was known, the following:

[7] Herreshoff, L. Francis, "The Measurement Rules" from *The Common Sense of Yacht Design Vol. II*, The Rudder Publishing Co, 1948. p.46.

"Nineteen boats figured in the championship percentages in the 18-Foot Knockabout Class, eleven less than were on the list a year ago. There were four new boats built, and none of these was able to get the championship. The attendance of the 18-Footers at the open races was not nearly so large as in former years, and this coupled with the fact that *there is a great falling off in the building of new boats, would indicate that the class is on the wane*. [Emphasis by author] There have been orders placed to build only three new boats so far this fall, and as these will probably be raced only at Duxbury, they are not likely to give much strength to the class as a whole. It is quite probable that the falling off in new boats is due to the great changes that are being made in the racing rules, which injure the market for 18-Footers in other waters."[8]

This Universal Rule and its application would give rise to differing classes based upon waterline lengths. The Classes spawned the assignment of letters and as such 18-Foot Knockabouts were also "I Boats"; perhaps now under the general aegis of this larger class defining rule. There would also be R, Q, P and other letter classes as well.

From these remarks it would seem 18-Footers would soon disappear. But that was not to be. Instead they rebounded and over the course of the next sixteen years would continue to race and be well regarded. After World War I these gaff-rigged I boats would share the spot light with a rerigged sister essentially with the same hull but now sporting the Marconi rig. (This being named after the general form presented by a yacht fitted with a mast designed as an antenna to send and receive radio signals.)

The Rudder in a 1920 writes about the new 18 foot Marconi rigged boat:

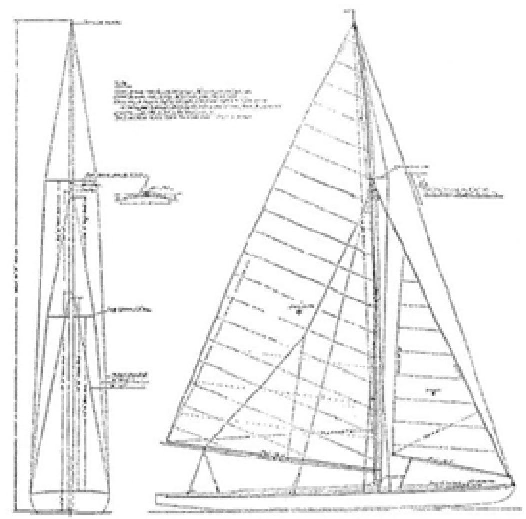
"A boat that will attract attention in the Massachusetts Bay racing fleet is the Marconi-rigged 18-Foot Knockabout designed by Charles D. Mower…

The boat is designed to the restrictions of the Massachusetts 18-Foot Knockabout Class, which has been for many years one of the most popular racing classes in Massachusetts Bay. She is the first new boat designed with the Marconi rig, as only Gaff Mainsails has been used up to this time. At a recent meeting of the Knockabout Association it was decided to allow the use of the Marconi rig with the restriction that the length of the mast should not exceed 42 feet. The class rules allow a total sail area of 450 square feet with not over 360 square feet in the main sail. The sail plan shows the full height of mast allowed by the rules and the maximum area of mainsail.

The Boat is being built at Graves at Marblehead for a well-known Boston yachtsman."[9]

Her dimensions are:

LOA…………31'0"
LWL…………18'0"
Breadth………..7'6"
Draught …..….5'0"



Sail Plan of an 18-Foot Knockabout Showing Details of the Marconi Rig

Figure 7 - Marconi Sail Plan 18-Footer. *The Rudder*, March 1920, p.44

THE I BOAT DESIGNERS

It would now be in order to consider the spectrum of I Boat designers. Of particular note, E. A. Boardman, designer of those last I boats found in Rockport Harbor.

E. A. Boardman wrote *The Small Yacht* in 1909. Basically a primer for the neophyte, it included a series of design plates of the popular Knockabout 18-Footer. The four following figures from *The Small Yacht* also include the lines for a typical 18-Foot centerboard Knockabout found south of Boston at Duxbury.

[8] *The Rudder,* 1905. p.630

[9] *The Rudder,* 1920. p.44

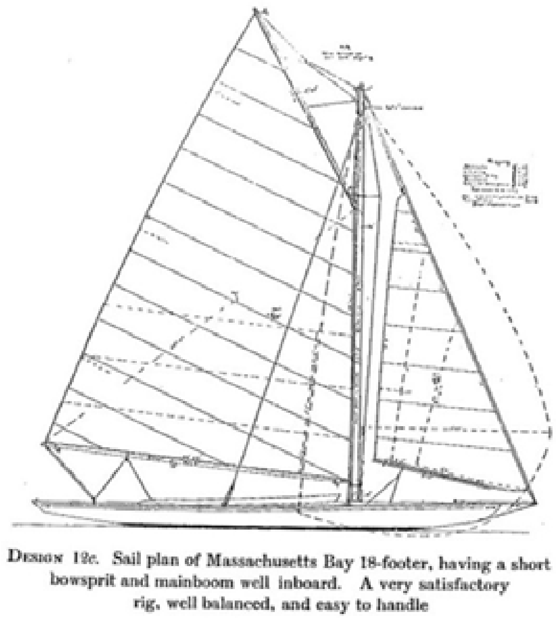


Figure 8 Sail Plan from *The Small Yacht*, Edwin A. Boardman, Design 12c, 1909

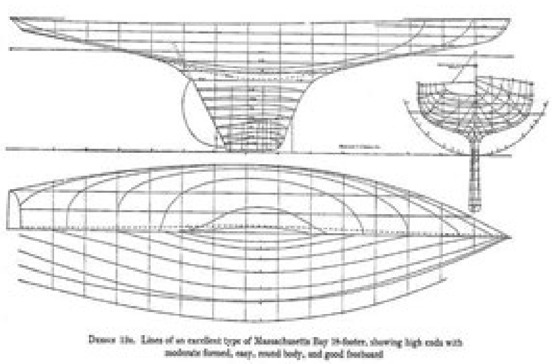


Figure 9 Lines from *The Small Yacht*, Design 12a

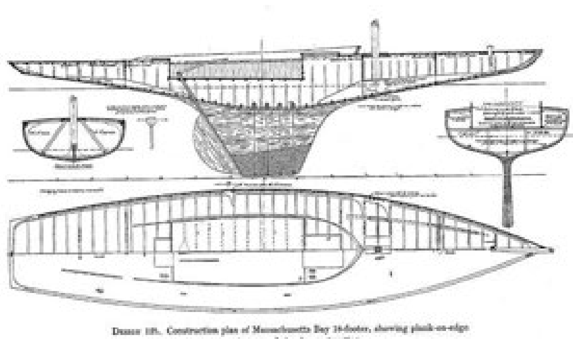


Figure 10 Construction Plan *The Small Yacht*, Design 12b

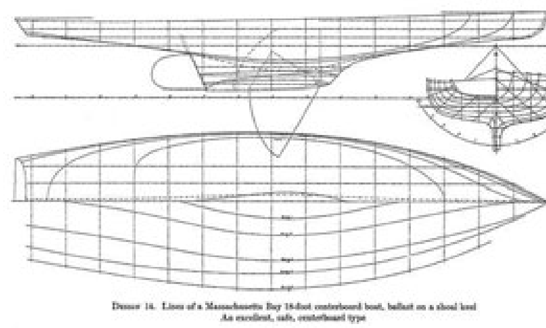


Figure 11 Lines with centerboard, common to Duxbury Knockabout 18- Footer *The Small Yacht*, Design 14.

The Small Yacht was published three years after the adoption of The Universal Rule*;* thus we find that 18-footers had survived. Greater proof lies with the number of sailors who continued to sail, race and enjoy them. While they were small, they were often raced and crewed by professionals to the great disappointment of both the younger and older seasoned amateurs.

Since it is the boat we are interested in only a few more definitive words need be said about Rules here. Later when designers are considered there will be further asides. That I Boats were not strictly a one-design class has been proven. They were an open-class design and their rules, while restrictive allowed "greater creative variation." L. Francis Herreshoff's pithy observations regarding one-design class add some insight to I Boats as well:

"The theories of the one-design class are good ones- if they are carried out. One of these theories is that by building several yachts alike and at one time a saving in cost can be made. The other theory is that much closer competition can be had. But neither one of these theories is as true as the general public has been taught to believe…"[10]

"…if there is any valid excuse for one-design yachts it is that they need not be freaks built especially to beat some measurement rule, and while it is true that most of our older one-design classes were built to some rule or other…
…I am very sorry to say that of late years the one-design classes are the biggest freaks we have."[11]

The open-class I Boats, with a greater design variation allowed, ultimately gave rise to a sailing machine that did sail particularly well to local conditions. 18 foot

[10] Herreshoff, L. Francis, *The Common Sense of Yacht Design Vol. II*, The Rudder Publishing Co*,* 1948. p.60
[11] Ibid., p.61

Knockabouts were not so much extreme design freaks but the result of searching for and achieving the greatest speed under those defined conditions. The inherent construction limitations imposed with the materials at hand at the time was also felt. Boardman's final sorté into I Boat design, still searching for optimum efficiency, produced a special finale to the I Class and a very devoted group of sailors whose love of them is obvious.

As events dictated Is would dwindle to one I in Rockport's Harbor, then none. The love of I Boats found fresh flower in one I Boat owner's sons. Years later an I, not an original, but rebuilt Phoenix-like from the remains of a survivor came to be. Its hull while true to form does not, in essence, follow original dynamics. This being so, one would think a totally inferior regeneration was the result. This is not the case, for the experience of Phil Bolger in reinterpreting the hull plans found in *The Rudder* for HAYSEED- not a Boardman design- positively endowed the result. This is due, no doubt, from years of experience and finessed, in his representation, any negatives to the design variations and sacrifices from the original.

I BOAT DESIGNER BIOGRAPHIES

- **Edwin Augustus Boardman 1877-1943**

Born in Boston, and Harvard educated he represented "Boston Brahmin" in its fullest sense. He is characterized as a sportsman of the yachting set. A winning helmsman of scow and Sonder scow racing, and although not verified, but a safe bet, his own 18-Footers. He is characterized as a yacht designer by avocation more than vocation. His final designs showed experience to be the best teacher. Those remaining I's at Rockport are testament to this. He also designed the Eastern Yacht Club 17 foot one-design later called the Northeast Harbor "A Class." His two books written regarding yachts and racing are listed in the Bibliography. He did later sail on ENDEAVOUR informally with T.O.M. Sopworth during the Halcyon days of the Park Avenue Boom and Quadrilateral Jib. (See the Appendix for information on his 18-Footer ALLANADA.)

Boardman's brother Reginald also sailed, raced and won his share. They held forth from Manchester Massachusetts and with a winning presence at the helm of any boat gave notice they were the ones to beat.

- **Bowdoin Bradlee Crowninshield 1867-1948**

He was born in New York City to a prominent family with seafaring heritage reaching back to Salem. His family returned to Boston the next year and then to Marblehead in 1874. He entered MIT, but soon transferred to Harvard and graduated in 1890. His initial sailing experiences demonstrated he was a natural. After a hiatus of several years "out west," he returned home to work in a yacht design firm and subsequently opened one of his own in the late 1890s where he was successful with commercial and yacht designs. The soundness of his designs would greatly influence those who followed. His book *Fore an Afters* did define schooner technology. The seminal oil carrying tanker THOMAS W. LAWSON- a seven-masted schooner- heralded the end of coasters, but influenced more seaworthy designs and the lot of Gloustermen with their subsequent application to this ageless workboat. His one-design Dark Harbor 17½, 12½, Northeast Harbor B Class, and America's Cup defender INDEPENDENCE all added to his fame. His term as Secretary of the Navy added to his ship design experience and ensured his country's place as a world Naval presence continuing to this day. (See the Appendix for one of his 18-Footers.)

- **Small Bros., John F. Small 1860-1930**
  Samuel N. Small date unk.

Little is recorded of their early years. Their history begins as amateur designers whose main goal was to beat the handicapping rules of the day. Success caused them to open a design firm where they designed cruising, open and one-designs sail and powerboats. Their winning design HAYSEED is the baseline I Boat of this paper. Powerboats and large cruising schooners, yachts of all sizes and description were drafted from their office and well accepted in their day.

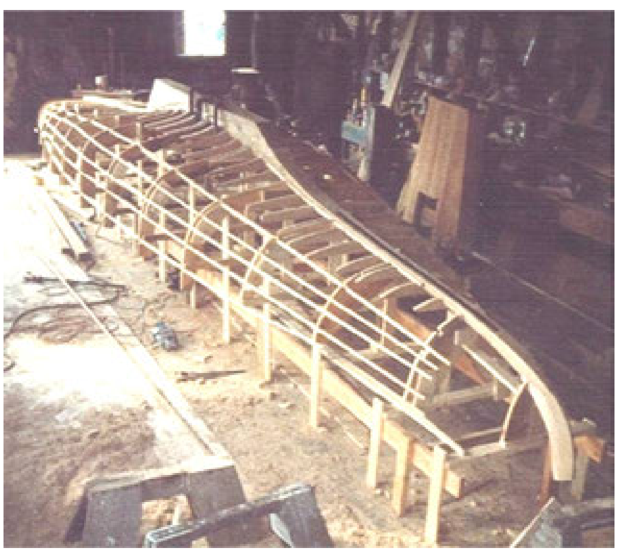
- **William Starling Burgess 1878-1947**

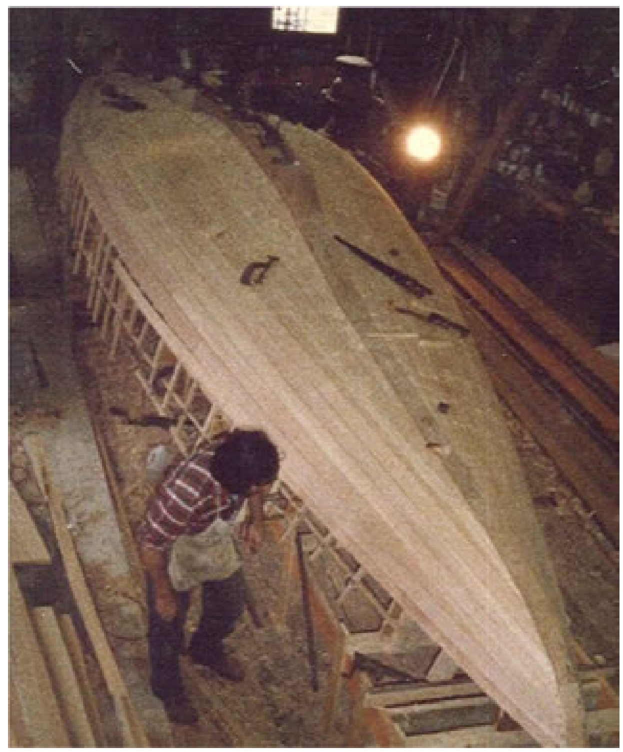
Arriving into this world to a Boston Brahmin family it was not entirely a perfect entry. He was born with a cleft palate. This would be corrected easily with the family wealth at-hand, and even though risky for the time, he seems to have survived this nascent ordeal with ease. Later life would cause greater turmoil, but not from physical limitation. Orphaned at the age thirteen with the death of both his parents, W. Starling was as his father- acknowledged genius. Fredrick, his father, had entered the world of yacht design from scientific study. Force of fate, a family business made W. Starling turn childhood interest to livelihood. He was educated at Milton Academy and Harvard University. Although brilliant he would not finish to receive the degree. He is noted for a series of design partnerships including a stint with A.A. Packard. Later he would team-up with Glen Curtiss, no doubt adding to Curtiss' Flying Boat fame with his hull design genius. His personal life, as with most men of genius, seems to be one of fleeting love and constant turmoil. Yet this American original Yankee Renaissance Man wrote poetry and probably was a person of exceeding charm no doubt undone by a directness that often accompanies such genius. As this paper's focus is 18-Footers, these he also did design. America's Cup defenders RAINBOW, ENTERPRISE and RANGER and Quincy Cup contender OUTLOOK add to his fame. His designs of successful racing yachts usually were to the extremes that rules allowed, producing winners. He was, with his inherent iconoclastic Yankee genius, a rule beater extraordinaire. A catastrophic fire at his firm in Marblehead destroyed his early designs, otherwise his early 18-Footers would be a "cherry treat" for this paper's purpose had they, like Boardman's designs survived.

SECOND WIND-CONSTRUCTION

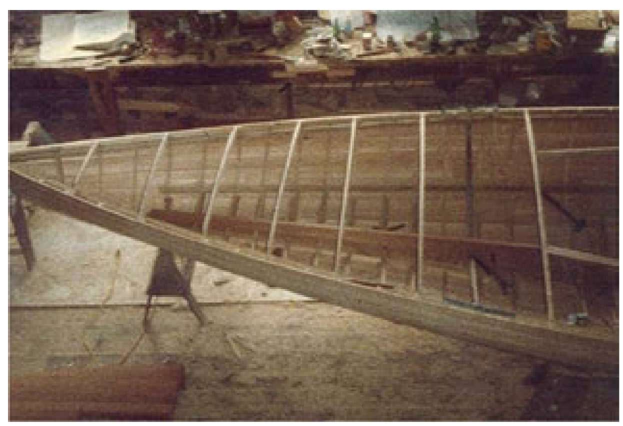
Being a child in company with your father for an outing on the water is treasured time together. It is not *all* about sailing. It is about nurturing, sharing and passing along that which was found to be true and good. That a son grown to manhood would seek to rekindle that in building a similar boat is not a sign of failing to find something better to do. It is the demonstration of that shared time was not to be surpassed. Some special things stand the test of time and will, when viewed by others who have not acquired that jaundiced eye of jealousy, be instantly understood. What follows are a series of photographs in consideration of that rebirth of a shared and treasured vessel and love also given.

SECOND WIND- Building at Montgomery's Yard Gloucester[12]





[12] Photographs courtesy Todd Sayce



- **Launching**[13]

[13] Photographs Courtesy Sayce Family

Love renewed[14]

INTERESTED??

No. 8395—Knockabout Tokalon; 18 feet water line, 30 feet over all, 2 feet 6 inches draught; all outside ballast centerboard houses in keel. Cabin over 8 feet long, sleeps three on transoms, one on floor; ice-box; dish, grub, clothes lockers; cockpit, mahogany seats, companion slide, doors, hatch forward and trimmings mahogany. Launched last year, constructed best-known manner, best materials obtainable. Sails, mainsail, two jibs, spinnaker. Boat exceptionally fast, ideal single-handler, non-capsizable, perfectly tight, will last a lifetime. Price low. Owner building racing machine. Address R. J. Randolph, 101 Milk St., Boston, Mass.

Figure 12 - 18-Footer For Sale *The Rudder*, 1902, p. 171.

ACKNOWLEDGMENTS

It is with greatest regard the writer wishes to thank the Sayce Family for taking time and being patient in my quest to discover where these particular sailboats originated and why they loved them so. The timely application of "Salt Water Therapy" is also greatly appreciated.

Mr. James Chambers, also a former I boat owner and Mary Ann Heath, whose civility and kindness initially gave me impetus to take up and continue my questions about a very unique vessel first seen over 25 years ago.

[14] Photographs courtesy Todd Sayce & Family

The staff at the G.W. Blunt Library at Mystic Seaport Museum, and The Phillips Library of The Peabody Essex Museum contributed greatly. Hart Nautical at MIT Museum, while somewhat bemused at my questions, did answer and quickly.

Mr. Matthew P. Murphy of *WoodenBoat*, George Schwartz, Peabody Essex Museum, Peter Vermilya, Mystic Seaport Museum; who have all run afoul of me should receive my greatest thanks for their patience and continued good regard despite my Yankee temperament.

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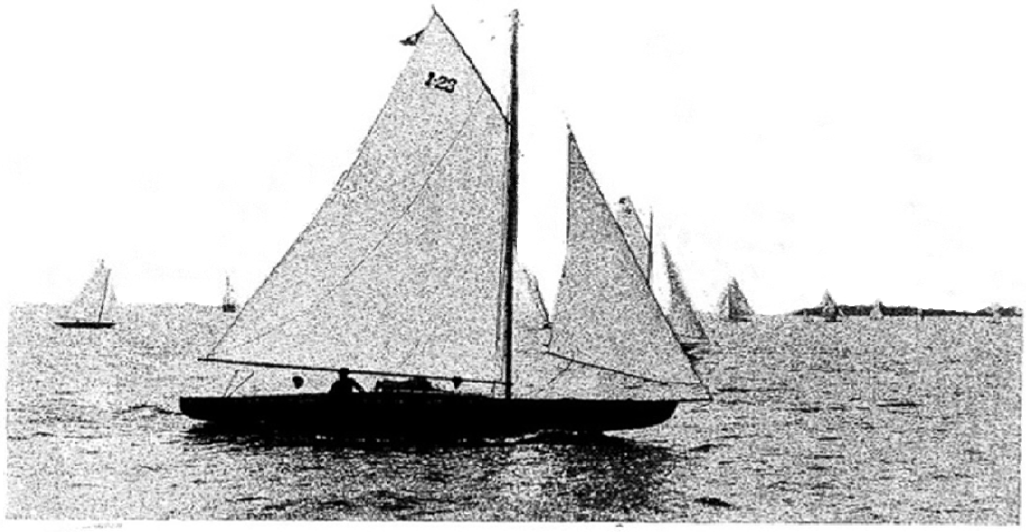
- Small Bros., pp. 418-419.
- Burgess, W. S., pp. 65- 68.

ABOUT THE AUTHOR:

Philip West Mallard II was born "down east" cursed with "Sea Fever." His paternal grandfather and one uncle built boats at Bath, Maine. He is named after another uncle: a merchant marine sea captain. Often, he accompanied his father when he would test *his* models at high tide on *The Forest River* in Salem. In the winter he would "hard water sail" with his dad and family. His maternal side contributed with trips to another uncles' boat shop filled with wooden boats awaiting delivery to customers throughout New England**.** In the early evening she would read sea stories from a column titled ***"Under the Lee of the Long Boat,"*** gleaned from treasured copies of her Grandfather's Publication: *Little Folks Magazine.* Returning from service was the awakening of that long forsaken love of the sea in the form of a *40'Owens Cutter*. Phil Mallard presently is employed with the Department of Environmental Protection. His love of the sea and good boats crowds time spent with family and maintaining of the seminal publishing presence of the ***The Naturalists' Directory & Almanac***. Educated, he holds a Master's degree and Public Health credentials; a 100 ton licence rounds out the paper presence. In regard to a remark made by Mystic Maestro- John Gardner- about finely built boats that "if they look right they usually are;" a chance sighting of an "I Boat" and this paper is an attempt at capturing the essence of that remark, upon its recipient, and that waning apirition sighted on the water in Rockport Harbor so many years ago.

APPENDIX

THE RUDDER 631



Hayseed, Champion 18-Footer — Photo by Stebbins

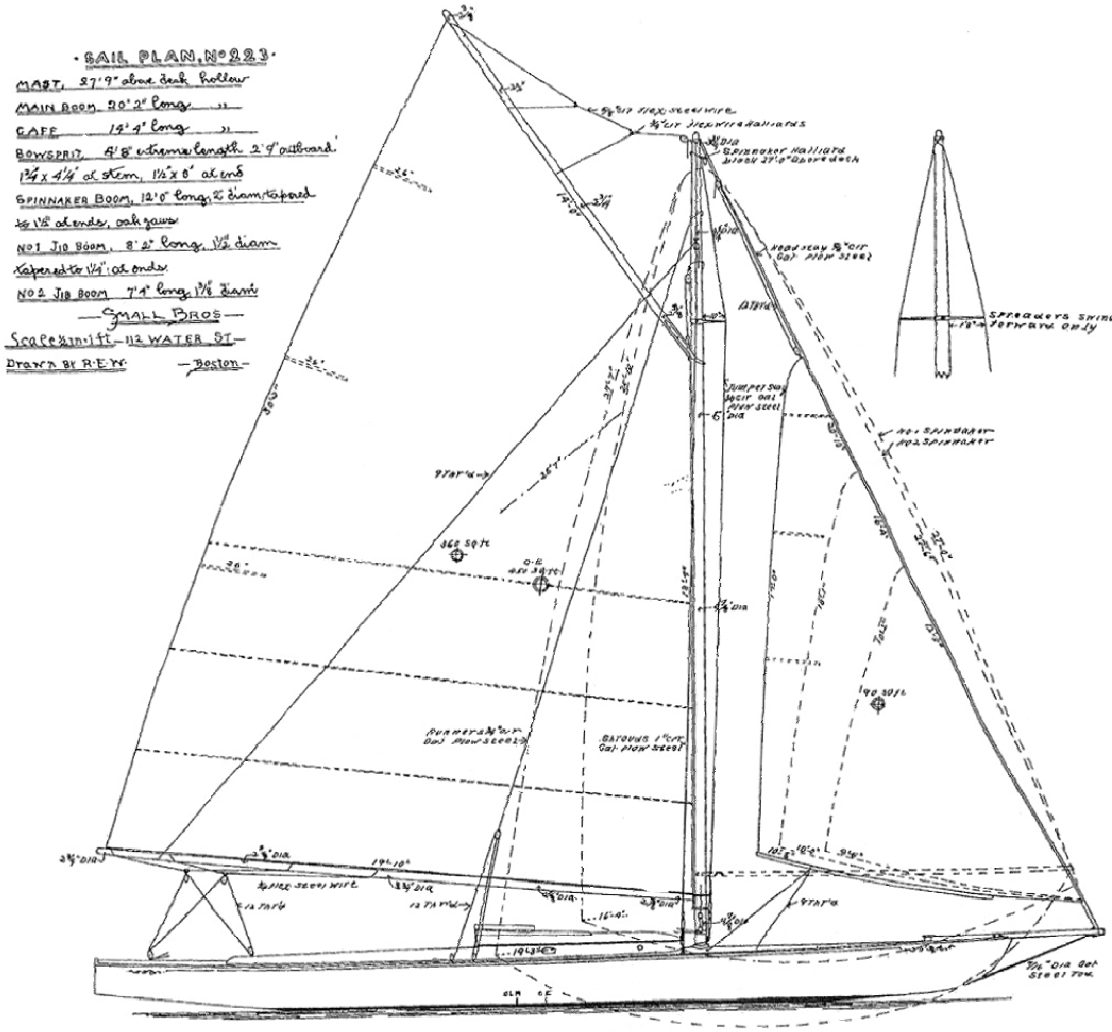
Nineteen boats figured in the championship percentages in the 18-foot knockabout class, eleven less than were on the list a year ago. There were four new boats built, and none of these was able to get the championship. The attendance of 18-footers at the open races was not nearly so large as in former years, and this, coupled with the fact that there is a great falling off in the building of new boats, would indicate that the class is on the wane. There have been orders placed to build only three new boats so far this Fall, and as these will probably be raced only at Duxbury, they are not likely to give much strength to the class as a whole. It is quite probable that the falling off in new boats is due to the great changes that are being made in the racing rules, which injure the market for 18-footers in other waters.

Hayseed, which takes the championship in the class for the second consecutive season, was designed by Small Bros. Her record is a particularly good one, as she, like Tyro in the class above, did not fall below third place. Out of eight starts she was first five times, second once and third twice. The racing between Hayseed and Bat was close, as it had been in the season of 1904. Bonitwo, a new boat designed by Crowninshield, started out well and made a good showing, her skipper, the son of her owner, being probably the most youthful sailor in the class. The contest between Bat and Bonitwo for second place was very close; in fact, there was not much to spare between either of the first three boats.

Hayseed II., also owned by H. L. Bowden and designed by Small Bros., was the first choice of the owner for a championship winner. After some racing, however, it was found that Hayseed of last year had a little more go in her, and it was she that was then sent for the championship, which she captured.

A-1 HAYSEED from "Yacht Racing Season," *The Rudder*, 1904, pp628, 631

1903



Hayseed. Designed by Small Bros.

HAYSEED

THROUGH the courtesy of Small Brothers we are able to publish the complete design of the boat which proved herself the fastest of the Boston 18-foot knockabout fleet, and won the Massachusetts Y. R. A. championship after a season of the hardest racing. Her record in Association races shows eighteen starts with seven firsts, and a percentage of 87.2. For her entire season's racing she started twenty-seven times, winning fourteen firsts, five seconds and one third place. Throughout the season she was sailed by her designer, Mr. John F. Small.

Hayseed was the most extreme boat in the class last season, and as her design shows she is very shallow-bodied with hard bilges carried out into low and very full overhangs. One would not expect such a design to be fast in light weather, but Hayseed proved a good boat in all conditions, though at her best in strong winds. The design meets the class restrictions in every particular and is interesting as showing the kind of a craft developed by rules intended to produce a wholesome type of small boat. Hayseed was built by Graves, of Marblehead, for Mr. H. L. Bowden.

Her dimensions are as follows:

Length, over all	30	feet	11	inches
Length, water line	18	"	0	"
Overhang, forward	6	"	6	"
Overhang, aft	6	"	5	"
Breadth, extreme	7	"	6	"
Breadth, water line	7	"	3	"
Draught	5	"	0	"
Freeboard, least	1	"	6	"
Displacement	4,075 pounds			
Lead keel	1,750 "			
Total sail area	450 square feet			

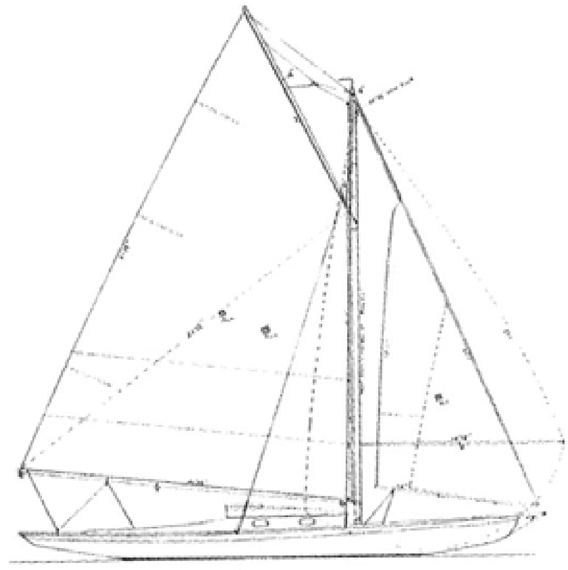
A-2 HAYSEED sail plan from *The Rudder*, 1903, p 380.

ALLANADA

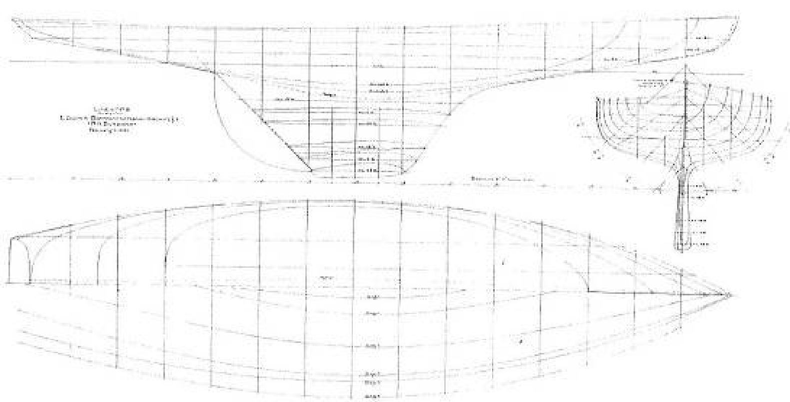
The eighteen-foot knockabout Allanada was designed by E. A. Boardman and built by T. I. White, of Manchester, Mass., for A. T. Malcolmson, of Providence, R. I. She was built for day-sailing and short cruises, but showed a clean pair of heels to most of boats she tackled. She is very able, carrying her sail when others have to reef. She has a comfortable cabin and cockpit.

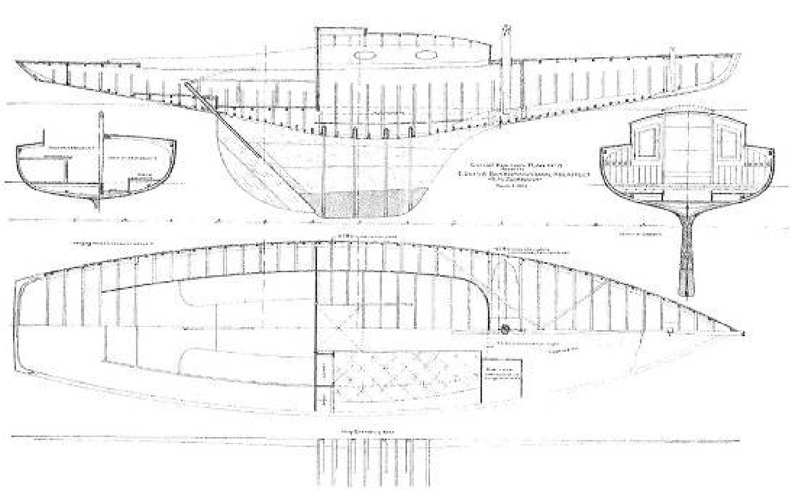
Her dimensions are:

Length over all	31 feet 0 inches
Length water line	18 " 0 "
Breadth	7 " 6 "
Draught	4 " 11 "
Ballast outside	1850 lbs.
Sail area, mainsail	360 square feet.
Sail area, jib	90 " "
Total sail area	450 "



Allanada





Eighteen-Foot Knockabout Allanada, Designed by E. A. Boardman

A-3 Boardman 18 Footer, *The Rudder*, 1904, pp.30, 31, 32.

1640

No. 1640—For Sale—Crack 18-footer, designed by Crowninshield; keel boat; very able and fast; one of the nicest boats in the fleet for day sailing; 30 feet over all; 18 feet water line; 7 feet beam; 4 feet 8 inches draught; built in 1902; in first-class condition in every way; two suits of sails, Ratsey, and Wilson & Silsby, first-class order;; finished in mahogany; this boat is a very safe boat for anybody to handle, as one person can handle her easily as she is non-capsizable; 1,850 lbs. of lead on her keel; bronze fittings; mahogany hatch, companionway; is one of the handsomest boats of her size afloat; hollow mast and boom. Apply to E. A. Boardman, Naval Architect and Yacht Broker, 20 Central St., Boston, Mass.

Appendix - 4 A Crowninshield 18-Footer. *The Rudder,* 1904, p. 20

The BISSET Clan
of Darien Connecticut
is pleased to be a sponsor of the

3rd Classic Yacht Symposium 2008

"CORSAIR"

This 30-foot, 5-inch tender was designed and built by Nathanael G. Herreshoff in 1925 for J. Pierpoint Morgan's yacht "*Corsair*". It was purchased in 1982 by NYYC member and Herreshoff Marine Museum board member Alfred G. Bisset. *Corsair* was restored in 2005/06/07 by Mt. Hope Boatworks. Work done so far will surely help keep this lovely craft alive for another 80 years.

Fred

CORSAIR: Alive for Another 80 Years

Jim Titus, Mount Hope Boatworks as interviewed by John Palmieri, Curator Herreshoff Marine Museum
With postscript by long time owner Fred Bisset
Photos courtesy of the owner unless noted

Figure 1 - CORSAIR's owner Fred Bisset salutes upon return to service September 16, 2006

INTRODUCTION

Designed and built by the Herreshoff Manufacturing Company (HMCo) in 1925 for J. P. Morgan's steam yacht CORSAIR III, the 30 foot motor launch CORSAIR (HMCo #381) is a superb example of the many such craft they built as tenders to large vessels. After 80 years of service she suffered severe hull failure; a hogged sheerline, multiple broken frames, soft underwater planking and keel lacking in strength and unable to hold shape. In the CYS 2006 paper *The*

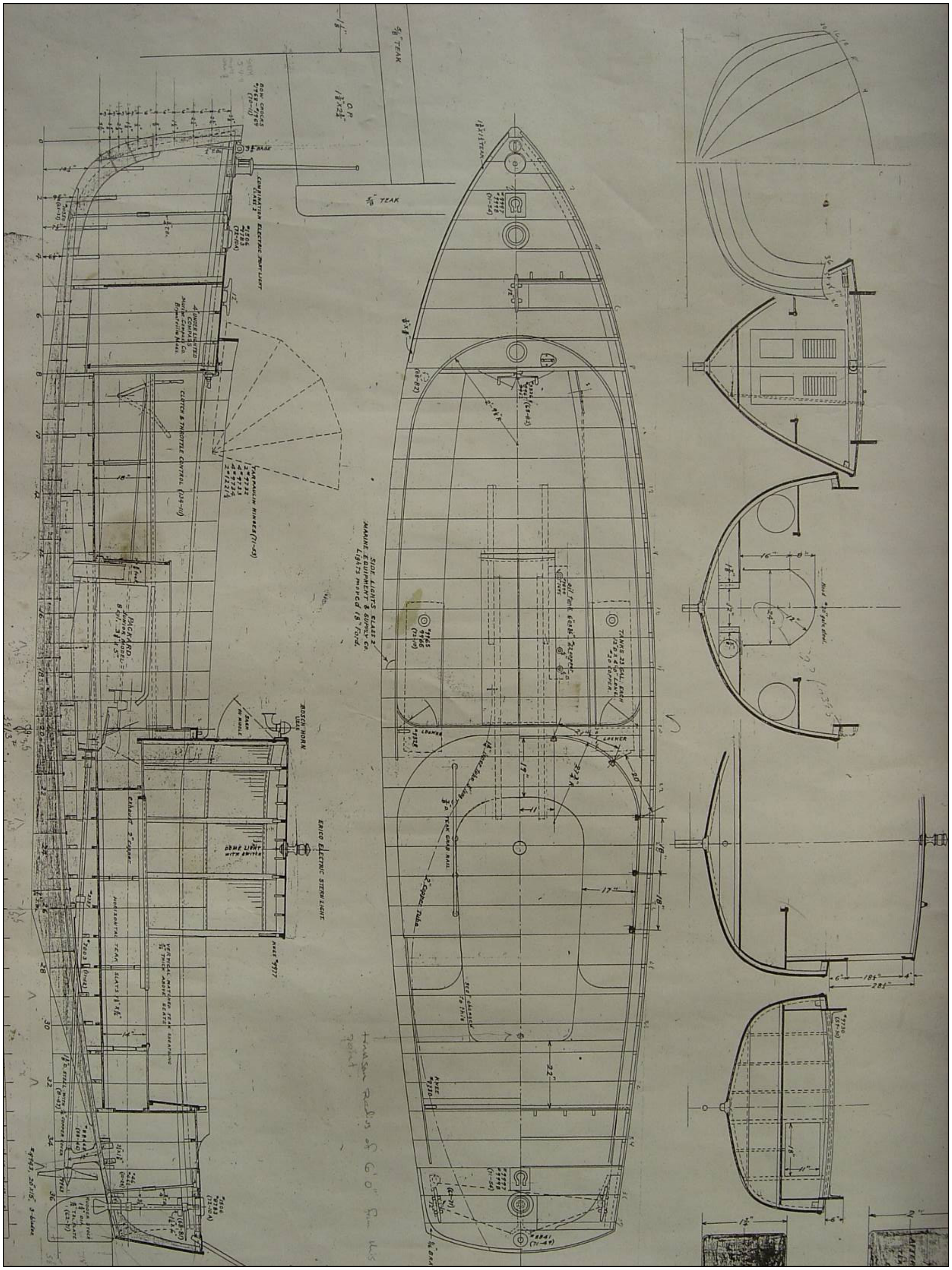


Figure 2 - CORSAIR HMCo #381 Herreshoff Manufacturing Company Construction Drawing 002-105, 1925
Courtesy Curator Hart Nautical Collections MIT Museum

Restoration of the 1925 Motor Launch CORSAIR by Seth Hagen of the Mount Hope Boatworks (introduction by owner Fred Bisset) described the launch's history, conditions found, the work to restore hull shape and the plans to restore hull structure. The planking had just started at the time of the CYS 2006 presentation in April 2006. CORSAIR was subsequently launched in September 2006 and we thought it appropriate to complete the story of this significant restoration in the form of a post-action debriefing.

As background to my interview with Jim Titus, the owner of Mount Hope Boatworks, it is worth taking another look at the 1925 Herreshoff Manufacturing Company (HMCo) construction drawing of the CORSAIR launch HMCo #381. (Figure 2) As with all Herreshoff launches she is very lightly constructed with a minimum scantling backbone, two large open cockpits, little longitudinal structure and little deck and cross structure. (Figure 3) The integrity of both hull shape and strength depends upon maintaining the design configuration, good maintenance and careful support of the hull both in lifting and in dry storage. Specifically important are the backbone, the cockpit bulkheads (frames 8, 22, and 34), the midship cockpit coamings, the fore and aft decks and the transom.

Figure 3- Looking forward from the aft cockpit with the midship bulkhead removed. Illustrates the extremely light hull structure.

CORSAIR's structure and shape had been compromised by design modifications, age and probably some inattention when handling on land. Certainly when the museum hauled her September 2004 we did not use adequate slings with longitudinal keel support and were not ready to cradle the dangerously weakened hull.

So in addition to documenting the completion of the restoration the questions of greater import to us were the following

- Did the original approach to the restoration prove out ? If not why not?
- What were the important compromises to the hull structure and what did you do to correct them ?

RESTORATION APPROACH

The original approach was to deal only with the worst areas of deterioration as the means to restore the boat's shape, watertight integrity and structural strength. This concentrated on the aft cockpit, the area of most broken frames and weakened underwater planking. This was the way to get back into service in the shortest time with the lowest cost.

The deeper we got into the project the more apparent it came that shape could not be restored, without tackling other deficiencies caused by previous design modifications, collision damage repair and material deterioration. These have been well described in the CYS 2006 paper, *The Restoration of the 1925 Motor Launch CORSAIR* by Seth Hagen. Suffice it to say the attempt to the limit scope of repair in the long run cost us time and the owner money. The time taken is evident by the fact she was not launched until September 16, very late in the 2006 season. The hull was complete by July, but completing the additional interior finish work took most of the summer.

Jim Titus cited the following four areas as significant to the problems found in CORSAIR and the fixes applied.

- Failure of the backbone and underwater planking well covered in the CYS 2006 paper
- Midship- Compromise of the between cockpits bulkhead at frame 22
- Aft- Deteriorated transom, shortened after deck and loss of the bulkhead at frame 34.
- Planking- Collision damage repair with short topside strakes and many butts in close proximity to one another.

MIDSHIP STRUCTURE

Referring to Figure 2 the original design had a metal engine box in the aft end of the forward cockpit that mounted to the midship teak bulkhead. This bulkhead was not watertight because of the engine shaft, but there were no major penetrations. When CORSAIR was reengined with the current Yanmar two things happened..

1. The strength of bulkhead 22 was compromised by large holes cut to accommodate new larger fiberglass fuel tanks. port and starboard.
2. The aft end of the forward cockpit, including the engine was decked over side to side with a bridge deck. While this restored some strength it was now helping to hold the hull in its distorted shape.

Additionally more strength was lost when the aft cockpit coaming was cut to allow a centerline door to be installed in the aft cockpit deckhouse window.

To restore shape the bridge deck had to be removed. This led to the decision to restore the design arrangement to original, except that the centerline door and cut coaming were retained. The fuel tanks were moved aft under the aft cockpit seats so they no longer penetrate the bulkhead. After hull shape was restored a new teak tongue and groove bulkhead was installed. The straight sides and front of the new engine box are also teak. The cylindrical top is cold molded teak over three layers of western cedar core. (Figures 4, 5 & 6)

Figure 4 – New tongue and groove midship bulkhead; looking forward. Note cut in the coaming for the door.

Figure 5 – New seats with fuel tanks below in the aft cockpit- looking forward.

Figure 6- Engine box installed

AFT STRUCTURE

CORSAIR came in with her original transom, double planked teak over cedar. It had been built on a female mold and fastened from the interior. The transom knees and cleats were all hackmatack. The starboard cleat was rotted especially at the engine exhaust from metal sickness. The bronze exhaust fittings were leaking. We found the underwater part of the transom to be soft and rotted (Figures 7, 8 & 9)

Figure 7 – Starboard transom before removal of exhaust piping

Figure 8 – Interior of starboard transom evidencing rust. Note the double planked transom is fastened from the interior.

Figure 9 – Damaged cleat shows after removing rotted planking.

We planned to replace only the starboard cleat and damaged planking, but on further disassembly found the transom knee split at the rudder stock penetration (Figure 10), the port cleat split from over fastening and leaks from the deck coverboard had rotted the under deck oak beam.

Figure 10 – Rotted and split transom knee.

In addition to the transom problems the aft deck had been cut short one frame and the watertight bulkhead at frame 34 removed to accommodate a stern seat. Because of the cutback deck, loss of the aft bulkhead and lack of hanging knees it was decided to cold mold a new transom to provide greater panel stiffness. Three layers of 1/8" western cedar were layed up on a mold and vacuum bagged. (Figure 11)

Figure 11 – Three plys of cedar layed over the transom mold.

The transom was then fit to the new hackmatack cleats and transom knee. The final 1/4" teak overlay was applied after the transom was in place. Nick Eide did the transom work. (Figures 12 & 13)

Figure 12 – New transom knee and cleats

Figure 13 – Cold molded cedar transom in place before teak overlay is applied.

PLANKING

The garboard is solid mahogany and all strakes above are 5/16" mahogany over 5/16 cedar. Between frame fastening of the double planking is done with 7/8" cut copper nails applied from the exterior and clenched on the interior. Collision damage had been repaired in the past by a number of short planks. The number of butts in adjacent strakes over a few of frames is seen in Figure 14 by the white (existing) planking ends We decided to correct this weakness by scarfing new planks to the existing and adding butts only where they would have been placed following Herreshoff Rules for Wooden Yachts. Figure 14 also shows the weaving of the underwater planking into the topside planking at midships. Evident is the black polysulfide used as a underwater bedding compound (thickened shellac was used for the topsides).

Figure 14 – New planking scarfed and butted to existing white planks.

DECKS and DECKHOUSE

The forward deck is the original double-planked 5/16" teak over 5/16" cedar. It is in reasonable condition now, but because of its age will most probably be the next project. The aft deck is newer single planked construction. One change we made to the deck fittings is that the forward and aft deck mounted lifting rings are not functional. We did not install tie rods though the keel (The rings are shown in the CYS 2006 paper.).

The teak deckhouse and mahogany doors as well as the canvas cover are in good condition. We did install new 1/8" Lexan windows and replaced the deckhouse exterior trim.

The cockpit coamings had suffered longitudinal cracks in the midship area because of the structural modifications and loss of shape. These we glued and reinforced with pins installed from the underside.

LAUNCH DAY

Figure 15 – A proud name.

Figure 15 - In the water again.

Figure 17 – Making preparations for sea.

ACKNOWLEDGEMENT

It has been a distinct honor for both Mount Hope Boatworks and the Herreshoff Marine Museum to be involved in the restoration of CORSAIR. She is both a link to the history of the Herreshoff Manufacturing Company and to the world of yachting in the early part of the 20th century. We are all deeply indebted to Fred Bisset for his continuing commitment to the care and operation of CORSAIR. She brings joy to all who see her.

OWNER'S POSTSCRIPT

It is truly a joy to be cruising the "new" CORSAIR in Narragansett Bay and the areas around Bristol and Newport where I spent my young life as a Rhode Island boy. Since she is in such fine condition we now on two occasions have won First Place in the October Antique Car and Boat Celebration at Harbour Court. It is also rewarding to again give CORSAIR away for charity, with a full uniformed crew, for a "Cocktail Cruise on JP Morgan's Tender"- won this past fall by the now retired Chairman of JP Morgan, Sir Dennis Weatherstone, among other charitable folk. But best of all will be this September when CORSAIR will transport one of my daughters for her wedding from Harbour Court and The Inn at Castle Hill for the ceremony.

CORSAIR will be around for many years to come.

~Alfred (Fred) G. Bisset

ABOUT THE AUTHOR

Jim Titus started working on boats in 1977 while a student at Rogers High School in Newport. His experiences include two years building cold molded boats at Branton Yachts, five years in all phases of boatyard work at Codington Yacht Center (now Jamestown Boatyard) and eighteen years at Narragansett Shipwrights working on many Herreshoff classics. In 2002 Jim started Mount Hope Boatworks now located in Newport.

A happy launch day. Jim Titus on the left and Fred Bisset on the right with a member of the launch crew.

Painting Wooden Boats

Jim Seidel
International Paint (Interlux)
Figures courtesy of Interlux

A well cared for classic yacht always attracts admiring glances when she slips into view and although it generally requires more maintenance than other types of materials used in boat building it is worth the effort.

Wood is the only natural boat building material used today, and is notoriously difficult to finish smoothly. Wood, being an organic material, expands and contracts with changes in temperature and humidity, and today's plastic-like paint layers do not move around anywhere near as much as wood does. Consequently, the paint shows ripples at the edge of each plank after a season or two. How can you prevent this problem on your boat? You cannot avoid an environment with changes in temperature and humidity because that would mean never putting your boat in the water. So what can you do short of going to the trouble of fairing and painting the boat every year and finding a paint that moves as much as the wood does?

About the only way to avoid this rippling effect for more than one season is to cover the wood with a layer of fiberglass or Dynel and then fair the fiberglass covering so that a perfectly smooth finish is obtained. The fiberglass cloth is epoxied on and may be stapled to the wood before being covered with fairing compound. When the hull is perfectly fair, it can then be primed and painted.

But suppose you don't want to fiberglass the hull. How do you paint the wood for best results? Your first step is to get a feel for the wood you are working with. If it is plywood, the surface will be fairly smooth, and when you sand it you remove some of the softer wood, leaving ridges of harder material. Agressive sanding of the plywood may go through the thin top layer. Plywood must be sealed before painting. Failure to stabilize the white summer grain by saturating with the sealer will cause premature paint failure. If the soft, porous, white grain is not sealed, subsequent coats of paint will crack and check causing paint delamination. This was done with the use of clear sealer. Interlux Interprime Wood Sealer Clear was developed for boat builders that used plywood to cover grain and the "football" plugs in it. After the wood sealer was on and sanded a coat of Sanding Surfacer was applied to fill the high and low spots. Today a coat or two of clear epoxy resin can also be used to take care of this problem.

Figure 1 - 2 coats of Clear Sealer applied to transom. This helps seal grain and fill low spots.

If you have thicker wood on a strip-planked boat or a conventionally planked hull, you may have to sand it with a little more vigor and may find that there are definite ridges in the wood. In this case, you will need to seal the wood with a sealer. If you are using single part products, a coat of sanding surfacer and a coat of undercoater will be needed before the finish. When using epoxy resin use a high-build epoxy primer (a thick material about the consistency of runny peanut butter), and sand after the primer dries. If you have deep ridges and gouges to remove, you may have to use a filler such as AwlFair, Watertite or a thickened epoxy. Also, be aware of the type of wood you are dealing with. Oily woods such as teak prevent epoxy and paint from adhering properly. In order to paint or varnish teak, the oil will need do be removed. To do this you need to use solvents. A word of warning when using solvents: wear disposable rubber gloves and use the solvent recommended by the varnish or paint manufacturer. Manufacturers test their products to ensure that each is compatible with the paints and fillers they offer. Many professionals use acetone exclusively, but acetone dries very quickly. It may therefore remove oils only to deposit them elsewhere as it dries. Acetone can also soften paints, causing them to peel or lift if you abrade them after wiping.

Figure 2 - Filling and fairing the hull.

THE PROCESS

The first job is to clean the hull so that there is no grease or oil on the surface. This is accomplished by wiping with a solvent followed by a clean rag while the surface is still wet. The solvent removes any oil or grease that could be ground into the surface when sanding and prevent good adhesion to the surface of the wood. Sand the wood with 80-grit sandpaper. Aggressive sanding is necessary to open the grain and make it easier for the epoxy or sealer to penetrate the wood. After sanding remove the sanding residue with a tack cloth or a rag that has been dampened with solvent. The epoxy or sealer you use will depend on the topcoat you plan to use. Most paint manufacturers suggest that you use solvents, epoxies, and paints from their own product line to ensure that each solvent, epoxy, or paint layer is compatible with the layer next to it.

Single Part System – Painted Finish

With the surface sanded and clean, fill any nail or screw holes and any obvious imperfections with surfacing putty, sand that smooth and remove the sanding residue. When the surface is smooth and clean, coat it with one to two coats of clear sealer. The next step is to apply a sanding surfacer or high-build undercoater. Sand everything smooth and look for imperfections in the surface. Fill those with a glazing compound or trowel cement, smooth and apply another coat of undercoater. When everything is smooth, sanded and clean, it is time to apply the finish coat. This system can be finished with a single part finish such as an alkyd enamel, urethane modified enamel or silicon alkyd finish.

The marine alkyds have been around for a very long time, with good reason. Alkyds are easy to use and can be applied by brush or by spray. Alkyds dry or cure by oxidation of a vegetable oil such as soy or linseed oils. They can be used in a wide variety of temperatures. If you must paint in extremes of temperature alkyds will be the most forgiving. They are economical and provide a decent service life for the money but you will be repainting in 2-3 years. The solvent system of the alkyds is the least harsh of all of the oil-based paints. Alkyds are very flexible are generally recommended on wood boats that "work" or flex. They are not particularly hard and will scratch easily but if you have a high wear area they will be the easiest to repair.

Silicone alkyds are alkyds that have been modified with silicone to improve gloss and color retention but are still easy to use and apply. They retain all of the application ease of the alkyds but provide longer service life because the gloss does not fade as fast as alkyds. The solvent systems in silicone alkyds are generally the same as straight alkyds. Silicone alkyds were developed for use on steel but can be applied to fiberglass or wood.

Single part or oil-modified polyurethanes, such as Interlux Brightside, are made by taking polyurethane resins and modifying them with alkyd resins. Oil-modified polyurethanes retain all of the ease of application of the alkyds with better flow. Better flow means that the paint will level better on the surface to rid itself of application defects such as brush marks. Better flow means also that you cannot apply the paint as heavily, so it must be applied in thin coats to avoid runs and sags. Oil-modified polyurethanes provide higher gloss than that of alkyds and will retain that color and gloss longer. They are also more abrasion resistant and provide much longer service life, generally double that of alkyds. Single-part polyurethanes are not as flexible as alkyds but they are still very flexible and can be used on wood. The solvent systems are nearly the same as that of alkyds and pose no particular threat as long as the Health & Safety warnings on the labels are followed.

VARNISH

What is a Varnish?

Varnishes are generally made up of five specific ingredients: oil, resin, solvent, dryers and ultra-violet additives. Although these are the five main categories, there are many choices within each category. The right combination of all five ingredients results in a varnish's optimal performance.

Varnish Oil

High quality marine varnishes currently use Tung Oil. Tung Oil, which is derived from trees, provides long-term resistance to cracking and crazing. Another common oil is Soya. It is used for more standard quality varnishes.

The main purpose of oil in a varnish is to improve penetration into the wood. The more oil in a varnish the better the penetration. Tung Oil has been maximized for this purpose. Some manufacturers add Penetrol to varnish to enhance its penetration characteristics. International Paint does not recommend this be done as it may have an adverse effect on the varnish.

When discussing oil, the terminology *"long"*, *"medium"* and *"short" oil* is commonly used. This refers to the ratio of oil to resin in a particular varnish or coating. The "long" oils tend to result in longer dry times but greater durability in terms of gloss and color retention. Premium varnishes exhibit these qualities. "Medium" oils allow for faster drying times. They are, generally, restricted to low grade varnishes. "Short" oils are used almost exclusively on primers.

Varnish components

Resins

Hard resins used in varnishes are generally derived from natural materials. Resins come from tree stumps. Hydrocarbon resins are processed from crude oil. Phenolic resins are also derived from crude oil and some chemical processes. In general, the hard resin will be decided by the end use of the product. Phenolic resins are used primarily in varnishes and deck enamels where a faster dry and harder finish is required for maximum water resistance.

There is also a category of oil-modified Polyurethane Resins. In this category, there are two groups; aliphatic-modified polyurethane resins and aromatic polyurethane resins. Both of these resins offer excellent abrasion and chemical resistance. The aromatics are much more popular but do not maintain color, gloss and clarity as well as the aliphatics.

Solvents

We are all familiar with the use of solvents and their importance in making a product brushable and usable. The blend of solvents is very important to the leveling characteristics and varnishes are no exception. Solvents are used to increase the standard flow-out without destroying the full-bodied resin content. Solvents are also critical to maintaining the *wet edge* capacity of varnish. Wet edge is very important as it all allows the varnish to be applied without any trace of brush marks from overlapping new areas.

Driers

Although most people are not familiar with the use of driers in coatings they are very important. They act to accelerate the dry-through and the hardness of the coating. The blend of driers that is used in a varnish has a great impact on the clarity, color, the actual rate of dryness and the stability of the product.

Additive*s*

In addition to the basic components of the varnish (i.e. oil, resin, solvent and driers), the newest technology is related to the additives. The first commonly used is an anti-skinning agent which allows the varnish to maintain a wet surface upon exposure to the oxygen. Since varnishes have a very high content of resin, they are more likely to skin or develop a surface film. Hence, the use of anti-skinning agents in varnish is very critical. Flattening agents are used for interior varnishes. For interior varnishes the rubbed effect is desirable and consequently, the product is flattened to achieve that look.

Ultra-Violet Additives

The trend over the last decade in varnish technology, which most directly impacts long-term performance, is the use of ultraviolet stabilizers.
Ultra-violet (UV) light is energy. It must be either absorbed by the coating or dissipated. Without the use of adequate additives, the coating absorbs the UV light. This results in destructive processes:
Photo-degradation is the process by which the UV energy is absorbed by the film. This leads to a dramatic loss of gloss, film cracking and yellowing. This eventually results in delamination and peeling of the varnish. *Photo-oxidation* is the second phase of breakdown caused by oxygen in the coating itself.

Three basic additives to combat UV energy

1. *Ultra-violet Absorber (UVA)*- As the energy from UV light enters the paint film, it is diffused back as infrared energy (IR). Those UV rays not reflected are dispersed evenly throughout the coating so that no singular attack on the film occurs.

2. The second additive used in premium varnishes is a *Surface Stabilizer*. The surface stabilizer works at the surface to repair damage from UV light. The point of air/coating interaction is the area where the polymer regenerates itself by pulling polymer segments together. These additives maintain the gloss and color retention through constant surface repair and stabilization. By keeping the film surface repaired and stabilized, the

amount of water, which can attack a broken paint film, is reduced, prolonging the overall life of the coating.

3. The third additive that impacts long-term performance are the *Anti-oxidants*, which are used to combat photo-degradation and the effects of oxidation on the varnish film. Without the use of an effective anti-oxidant, the varnish will gradually fade and become cloudy. With a clear coating like varnish it is particularly important to maintain its color, as any change will be readily detectable.

Factors that affect the longevity of a varnish

Oxidation is caused by the presence of oxygen reacting with the varnish over a long period of time. The film becomes more and more brittle and, therefore, becomes much more prone to cracking and crazing. Water penetration through the varnish to the wood will cause cracking and delamination. Although no varnish is completely impermeable to water penetration it is generally negated with the use of hard resin. If the varnish is constantly immersed the water will penetrate and cause the varnish to blister and delaminate.

Contamination of a surface from salt is another important factor that affects longevity. Salt crystals will magnify the intensity of the sunlight and act as small magnifying glasses on your boat. Even with the use of a good UV package these small magnifications will cut through the coating fairly quickly. Therefore, it is very important to keep the varnish film clean of contaminants.

Chemical resistance to common chemicals such as gasoline or jet fuel is also important. The best varnishes are designed to resist chemicals and alcoholic beverages. Natural oil from within certain types of wood, like teak, will rise to the surface of the wood's fibers and begin to lift the varnish. This can result in detachment of the varnish. Care must be taken to remove as much oil as possible prior to varnishing.

Single Part System – Varnished Finish

Sand and clean as above, fill holes and small imperfections with putty that either matches the wood or will take on the color of the stain you will be using. A clear sealer can be used in this instance but I prefer to seal the wood with the same varnish that I will be finishing with. This ensures that at the interface between the wood and the varnish there is good protection from UV light. Thin the first coat of varnish 20-25% with the recommended thinner. This will help the varnish penetrate into the wood and build an "anchor" to hold the rest of the system. Thin the second coat 10-15% and thin the rest of the coats with as little thinner as needed to get the varnish to flow properly. Follow the recommended dry times and lightly sand between coats with 220-grit sandpaper. Sanding between coats not only helps to get better intercoat adhesion but by removing the high spots and leaving the low spots you end up with a much smoother finish.

Finishing using Two-Part Products

Clean and sand the wood as above, then, using epoxy resin, seal the wood with one to two coats of epoxy resin and fill the holes and imperfections with thickened epoxy while the last coat of epoxy resin is still tacky. Sand the epoxy with 120-180 grit sandpaper and apply a high build epoxy to help level the wood. Follow the manufacturer's directions on dry and overcoat times. Epoxy resin will go through curing stages and before overcoating with primer or varnish allow it to fully cure for 3-5 days. After the epoxy has become fully cured, the first step is to scrub it using soap and water and a stiff brush or maroon Scotch-Brite pad and rinse with fresh water. This will remove any amine blush from the surface. The blush is water-soluble and so it is best taken off with water. If left on the surface amine blush can cause detachment, yellowing of topcoats, or may even prevent primers and finishes from curing properly. The amount of amine blush is affected by the amount of humidity and temperature.

Once the epoxy is dry, it can be sanded back using 80- to 100-grit sandpaper. At this point, check to see that the wood is fair in every direction by laying a long thin batten on the hull. Shining a light from one side of the batten and inspecting it from the other side shows where you may have hollows or bumps. When you find hollows or bumps, you will have to decide whether to sand off the bump or fill the hollow. If you fill the hollow, try not to get more than 1/8 inch of filler on the hull. Thicker applications have been known to break off as the wood flexes while the boat is under way.

For filling hollows, you can use an epoxy mixture thickened with wood filler or microballoons to the consistency of peanut butter. Let the filler dry and sand it back using 80- to 100-grit sandpaper. When you are satisfied with the finish, paint the hull with a primer compatible with the epoxy. Between the primer and topcoat, you should sand with 320- to 400-grit sandpaper and wipe it down with a solvent. Before painting, however, you should check carefully to determine exactly what primer and topcoat to use. For example, if you are using Interlux materials, you'd use Epiglass epoxy, an epoxy primer, Interprime, the company's paint primer, and a topcoat such as Perfection or Brightside. All are compatible with each other. SP Systems uses its own SP320 epoxy, followed by SP Hibuild 302, a polyurethane undercoat, and a polyurethane topcoat. SP Systems does not make paints, so the company recommends several two-part polyurethanes such as Blakes, Epifanes or Awlprime 545, and an Awlgrip topcoat.

If you intend to varnish your hull, you should first coat the bare wood with epoxy and sand it back with 120- to 160-grit sandpaper. Then wipe it with a solvent and repaint it with epoxy again. Next, you need to sand the hull back with 220- to 320-grit sandpaper before starting to paint it with polyurethane varnish. Epoxy does not contain ultraviolet blockers, so you need to apply varnish over it. Between each coat of varnish, sand back with 320- to 400-grit sandpaper and wipe it down with a solvent. Let each coat dry completely before applying the next coat. In the old days it was possible to apply a second coat of varnish as soon as the first coat was almost dry. This cannot be done with modern polyurethane varnishes because the topcoat helps to stop the previous coat from drying. In an ideal world you should build up several coats of varnish on the hull to protect it completely. Each year, thereafter, the topcoat should be sanded back and a new varnish layer applied.

PAINTING

Painting a Hull Using a Brush

You would never think of painting your car with a brush but boats are painted with brushes every day. You may think that brush painting leaves brush marks runs and sags along the side of the hull, but this happens only if the job is not done properly. Feadship Koninklijke De Vries Scheepsbouw applies topcoats by brush to superyachts, with spectacular results.

To brush paint a hull, you will need the best quality equipment you can find and practice. Luckily, applying the sealer primer and undercoater will give you plenty of practice for applying the finish coat. Finish coats are typically applied with a top quality brush such as a badger hair brush but since primer and sealer coats will need to be sanded before continuing, top quality brushes need not be used although it may cut down on the time you will spend sanding. Look for brushes that will hold a full load of paint. Each bristle has a split end, making the final touching up work easier because the bristles are much finer and make the end result smoother.

When brush painting, keep a wet edge on the work – that is, don't let the edge dry out while you work in another area. The experts suggest that you roll on the first layer of paint and then use a dry brush to "tip it out." This means that the roller is only used to distribute the paint and the brush is used diagonally to get the paint layer smooth. The final stroke should be from sheer to boot top, lifting the brush off the job on the masking tape at the boot top. If you apply or lift the brush in the paint layer, you will find that it will leave a slight mark that you can see when the paint dries. It is best to have two people when you are rolling and tipping. One person rolls on the paint and the other follows directly behind and tips off with a brush.

Figure 3 - Rolling & tipping using the "Gang" painting method.

If you have to work by yourself work on small areas such as 1 – 2 roller widths wide running from the sheer to the boottop and the put the roller down and tip off. Then roll out another stripe and tip that off. Keep the work moving and if you have to stop, stop only at a place where it will be harder for the eye to pick up the edge. The judicious use of thinners will also help you obtain a better finish. What I suggest is to have a piece of plywood or Plexiglas next to the boat and when you are ready, apply the paint to the practice piece first. Watch the paint flow out. If it flows easily no thinner is needed but if it doesn't, add some thinner and apply it to the practice piece. If you find the brush dragging or the paint not flowing out you can also add thinner to the paint as you move along.

As for paints to use, single part paints such as alkyds, urethane modified alkyds and silicone alkyds are the easiest to use and most forgiving but two part paints will last longer.

Spraying the Hull

If you intend to spray your boat's hull, you will need to read the manufacturer's spraying directions very carefully. The manufacturer's product data sheet will provide a starting point for the pressures that should be used for different types of spray equipment as well as how much and what type of thinner to use. One of the most important pieces of equipment that can be used is a Zahn viscosity cup. By using a Zahn cup, you can accurately measure the viscosity of a paint mixture and recreate that viscosity every time you spray. The pressures at which you spray and even the length of the spray hose all affect the result.

The first step when spraying a hull is to check all of your equipment and lay out a plan. If it is necessary to set up staging make sure that the air lines can make it to where you want to paint without any loss of pressure. Check the gun itself to be sure it is clean and working properly.

Check the filters on the compressor to make sure they will filter out any water or other contaminants coming from the compressor. Water and oil will give you "fish eyes" in the finish. Next, make sure that the hose line is as short as possible. You can expect a slight loss of pressure for each extra ten feet of hose line or hose connection.

Before working on the hull of your boat, spray a test panel first to make sure you have the technique down pat. Start the spray jet before you reach the boat, spraying right past the hull. Then stop the spray jet when the spray is off the boat on the other side. Because there is a large amount of overspray, you will need to mask the hull entirely so that only the part you want to spray is exposed. You should also wear a respirator or a mask and suit with its own air supply. Two-part polyurethanes contain isocyanates that do serious harm to your lungs.

Don't try to put a lot of paint on in one application. If you do, you may well end up with drips and sags. Finish the first coat, sand it lightly, and apply a second coat to get the perfect finish.

You can paint your boat yourself. It's not difficult. If you're not happy with the results, simply sand it back and have a professional do the topcoat. At least you've done the preparation work, and it's the preparation work that takes a fair amount of time and costs the most money. By doing it yourself you can have a professional apply the final coat and get an end result that can be spectacular and a source of pride for years to come. Varnish work can be used to highlight cabin sides, coamings, seats, and rails to set off a perfectly faired and painted hull.

Whichever you choose be sure to follow the manufacturers application and health & safety instructions.

When the job is finished that's the time to stand back and enjoy the beauty, grace and style of a well designed yacht.

ABOUT THE AUTHOR

Jim Seidel (foreground) is the Assistant Marketing Manager for North America for the Yacht Paint Division of International Paint (Interlux). His responsibilities include managing the Interlux Technical Service 1-800 Information Helpline, Product Manager for the range of Interlux antifouling paints and DIY Topside Paints in North America. He writes the labels, product data sheets and information sheets for all products. He wrote the InterProtect Application Manual and edits the Interlux Boat Painting Guide.

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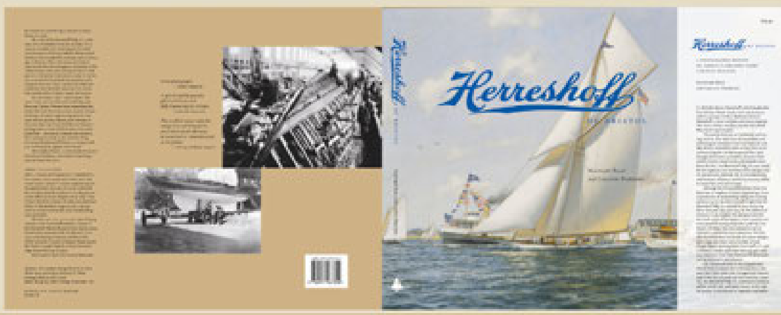

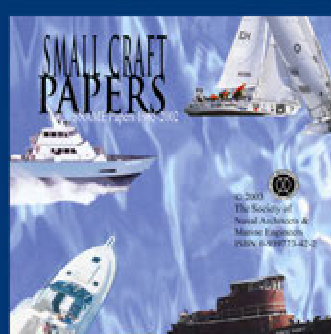

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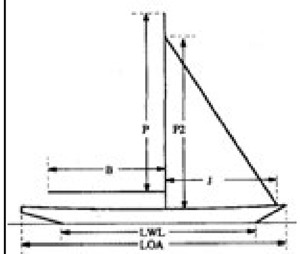

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