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THE MAGAZINE FOR WOODEN BOAT OWNERS, BUILDERS, AND DESIGNERS



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C. Raymond Hunt and the Deep-V Hull
A Guide to Rig Tuning



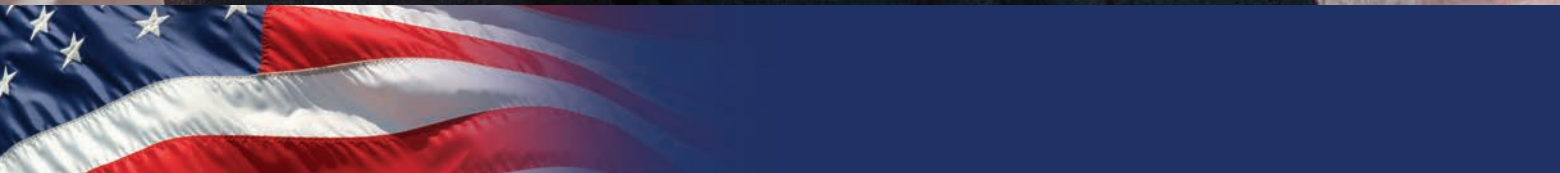
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Getting Started in Boats:

An Inboard Power Primer *Jan Adkins*

Cover: Meticulously restored in Gig Harbor, Washington, the 17' NO KA 'OI is one of 32 Fairliner Torpedos built between 1947 and 1953 at Western Boat Building Company in Tacoma.

Page 40.

Photograph by Greg Gilbert.



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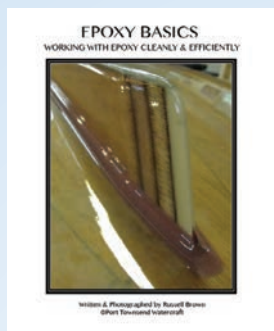
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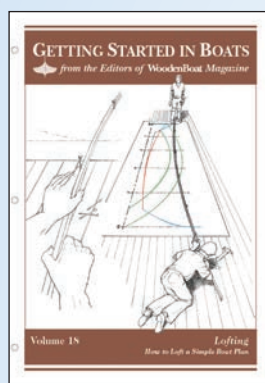
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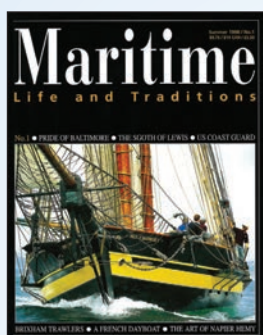
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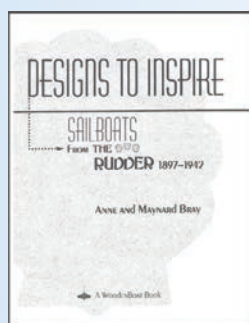
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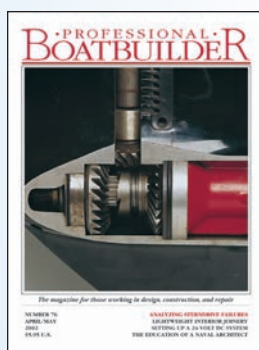
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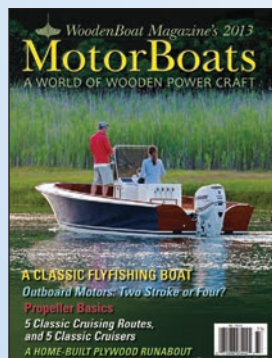
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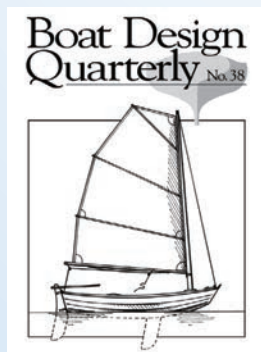
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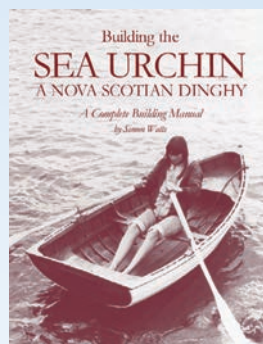
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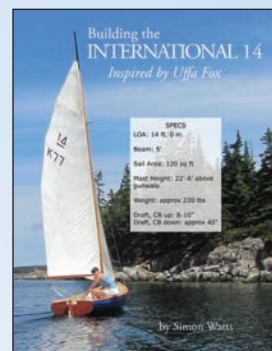
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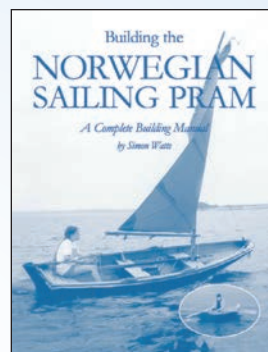
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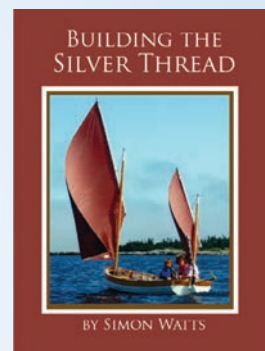
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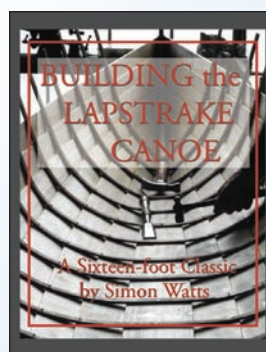
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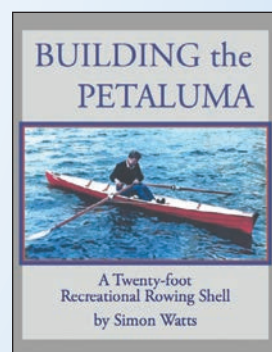
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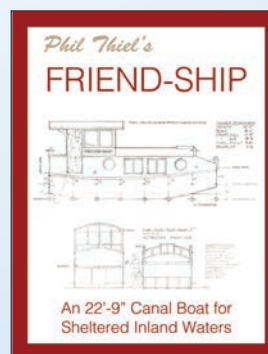
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EDITOR'S PAGE

Extreme Boat Ownership

The bright-finished runabout on the cover of this issue is a Western Fairliner Torpedo called NO KA 'OI. These pointy-sterned speedsters were built over a period of just a few years in the late 1940s and early 1950s by the Western Boat Building Co. of Tacoma, Washington. It's a rare boat, and its owner, John Lisicich, was so captivated by its shapes that he bought a derelict example from boatbuilder Bruce Bronson in 1998 and prepaid over the course of a decade for the boat's eventual restoration.

Several years before acquiring his boat, Lisicich had developed a passion for a rare musical instrument. In his article beginning on page 40, author Lawrence Cheek tells us about the extreme measures Lisicich took to gain possession of that instrument—and of his odyssey in finding and restoring his Fairliner Torpedo. The story of his search for the instrument is amusing, and wonderfully illustrates the obsessions many of us develop with beautiful wooden boats.

Consider Charlie Welch, a boat-mad young man who was active in the 1920s and '30s in Marblehead, Massachusetts. In the mid-'20s, he was sailing a Herreshoff S-class sloop in regular competition when he decided to step up to the larger R-class. In 1927, as Roger Taylor tells us beginning on page 24, he commissioned a 30-something-year-old L. Francis Herreshoff to design a breakthrough R-boat called YANKEE. This boat's construction, consisting of web frames and stringers, was well ahead of its time. YANKEE was a success, but Welch and Herreshoff did not rest on their laurels: Emboldened by YANKEE, they developed a truly revolutionary R-boat just a few years later—a boat called LIVE YANKEE. At the same time these boats were built he also had built a forward-thinking powerboat called DISPATCH—a rakish-looking craft that served as tender to the sailboats. Later, Welch moved from R-boats to the ultra-competitive 30-Square-Meter fleet. (Roger explores Charlie Welch's other boats more deeply in his forthcoming biography of Herreshoff, to be published in September.)

Kaci Cronkhite's relationship to her Danish spidsgatter, PAX (page 56), is another wonderful example of extreme passion for a boat. As Kaci tells it, she fell hard for PAX through an e-mailed photograph, and at that instant the boat "stole my heart." Subsequently, it also stole her wallet and schedule, as Kaci spent several years piecing together PAX's history while at the same time restoring the boat. PAX's origins were mysterious, and Kaci's history project included numerous research trips to Denmark, where the boat had been built and spent its early years.

The restoration of the Muskoka motoryacht RAMBLER, the result of which Tim Du Vernet explores beginning on page 64, is one more great example of extreme boat ownership. For various reasons, the boat's restoration was accomplished inside its lakeside boathouse—which itself had to be refurbished before the restoration could begin. The focus of RAMBLER's restoration was on the preservation of its originality—with a few carefully conceived upgrades.

These four examples—the YANKEES, PAX, RAMBLER, and NO KA 'OI—illustrate the different paths our obsessions can take. With the YANKEES and his other boats, Charlie Welch advanced the science and art of boat design. Kaci Cronkhite, on the other hand, has labored to document a boat's precious and fragile history. RAMBLER's various owners have over the years sought to preserve a unique type of yacht. And John Lisicich, with his NO KA 'OI, has been utterly beguiled by what author Lawrence Cheek calls "pure sculpture."

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Firefighting Afloat

You have misinformed your readers regarding LNG and CNG (Getting Started in Boats: Fighting Fire Afloat, WB No. 244). LNG (liquefied natural gas) is never carried on pleasure boats, as it must be maintained at extremely cold temperatures. A number of years ago it was popular to use CNG (compressed natural gas) as a cooking fuel aboard boats, as natural gas vapors are lighter than air. This is a huge safety factor, as CNG will not settle in the bilges of a boat; it simply rises out any upper opening and is vented away.

However, CNG is not as practical as propane. CNG must be highly compressed into big, heavy cylinders similar to diver's air tanks. In most pleasure boating areas the gas and compression facilities are not available. For many years some boatyards and marinas operated cylinder-exchange programs, but the use of CNG faded away as the propane industry improved cylinders, valves, remote solenoid shutoffs, hoses and fittings, and gas sniffing alarms.

Bob Calves
Urbanna, Virginia

Author Jan Atkins states that of the three types of extinguishers (A, B, and C), one type can not handle all three types of marine fires. Not true. There is a multipurpose or triclass ABC combination on the market. It is the recommended extinguisher for all boats under 65' by the American Boat and Yacht Council.

William C. Winslow
New York, New York

Counting Cannon

Dear Mr. Murphy:
In WB No. 244 (May/June 2015), I find a set of numbers that seem, to my less-than-fully-trained eye, anomalous. The cinema folk would call it "lack of continuity." I hope to learn something from your answer.

In "The Return of L'HERMIONE," on page 59, at the end of the section titled "Re-creating Ironwork," the statement is made that "the cannons averaged nearly four tons each to make, and L'HERMIONE's armament will account for about 44 tons of her 1,100 tons of displacement." My arithmetic for 32 cannon at 4 tons each gives 128 tons. Even allowing for the

smaller 6-pounders, that would seem to come to over 120 tons. Is there really over 65 percent wastage in the post-casting machining of 18th-century cannon replicas?

Thank you for producing a top-quality magazine, which I have enjoyed for almost 40 years.

Jeff Hull
Melbourne, Florida

Thank you, Jeff, for your good observation. There is a lesson to be learned here, but it isn't what you think: We editors are fallible beings. Here's author Marc Jensen's reply, sent from L'HERMIONE during her Atlantic crossing: "My apology for my poor math. I checked with the ship's boatswain and each 12-lb cannon weighs 2 tons, which at 26 cannons would be 52 tons. The 6-pounders weigh 1.5 tons each, for a total of 9 tons more. The overall weight is thus 61 tons."

—Ed.

Bootstrapping Boatbuilder

Dear *WoodenBoat*,

Thanks for the story about Nikos Daroukakis, but I had to stop reading it and write this letter. I generally enjoy Nic Compton's writing, having read his book about Iain Oughtred, as well as other works. But when he states that Daroukakis bought a plot of land on Gabriola Island, B.C., with savings from "running an espresso bar" in Vancouver, went on to build a small house and spend the next three years working "more than full time" on the boat of his dreams (a 42' schooner), I wonder whether I missed the gravy train when I lived in Vancouver during that era in the lucrative field of managing coffee shops. Daroukakis does eventually run out of money at the rigging stage but manages to complete his boat a year later without any explanation of where the money came from (presumably he went back to running a coffee shop).

Reading on, I learn that Daroukakis then pulls off another real-estate coup after crossing the Atlantic in his schooner, this time in Greece. He buys a plot of land on the island of Aegina and builds a house. I thought he ran out of money in B.C. and had to struggle to even get rigging? Did he sell his Gabriola property and enjoy a healthy arbitrage between a Canadian backwater property and that of

a property "just south of Athens," the nation's capital city?

Granted, this isn't *Forbes* or *The Economist*, but if the only mention of Daroukakis' finances as the source for half a decade of acquisitions and house and boat building is his savings from a near-minimum-wage job, then this story, for me, slips into realm of *The Adventures of Sinbad the Sailor*. Maybe some clarification or fact-checking or omission of financial details altogether is in order.

Paul Stastny
Calgary, Alberta

Nikos Daroukakis replies:

I will tell you how I paid my way—not to satisfy Paul Stastny's idle curiosity, but because I owe it to the many poor but determined people I met on the West Coast who somehow found a way to make their dreams come true. Having people around you to get inspired from is halfway to doing it yourself.

For two to three years while I was still working, every penny I could save became boat nails, cotton, bolts, wood, and tools. When I sold the café, I bought the little Yanmar engine, and with the rest of the money I built by myself with my girlfriend a house on a small property I bought with a loan from the bank. Whatever money was left became portholes, red lead, more used but good wood. All the black locust was given to me (some 20 trees) and milled and delivered for free by my good friend Bill. In return, I helped him for a week to mill some red cedar logs on his mill. Meanwhile, I made a living making furniture and joinery.

I suppose if I told Paul Stastny that I left Vancouver to sail to Greece with \$1,600, he will say it cannot be done. But that's what I did. I worked a bit on the way. I borrowed some money from friends. But I did it. The only modern instrument I had on the trip was a VHF and a used Seafarer depthsounder I bought for CAN\$30.

I bought the property in Aegina with the money I got after I sold a house I inherited from my father. I built the house entirely alone, from the foundations to the roof, using only hand tools, as I had no electricity. I lived with no electricity for 15 years, just to see if I could do it. And I've made my living working all these

years with hand tools and a generator that used to break down every week.

Sustainability?

Dr. Jagels,
In relation to your recent article on the situation with “sustainably” managed tropical hardwoods, I’m sorry to say there is no such thing. If the last 30 years have proven anything (to say nothing of the previous number of centuries), there is only one type of resource that can be considered in such terms: one that humans have no access to. As a woodworker of 40 years, I’ve been aware of the markets and the attempts to create some system for conscientious use. I recognized early on it was just another application of the oxymoron of “sustainable development” and, much as I loved the beauty of many tropical woods, stopped using them. I especially recall the commercial extinction of cocobolo, my favorite.

I’m fortunate to live where I can readily find a good selection of locally harvested wood, and that is the only way I trust to verify its source.

Brian Carter
via e-mail

Henry Barkhausen

Dear *WoodenBoat*,
We first met Henry and Alice Barkhausen (WB No. 243) in the harbor of Gore Bay, Manitoulin Island, in 2005. We had tied up DRAKE, our 1947 ketch, to the long pier there, and looked up to see a green-hulled gaff-rigged cutter tacking into the bay against a strong, gusty southwest wind. She made her way into calm water, the sails came down without fuss, and the vessel headed over to dock behind us. The breeze tried to blow her off, but she kept her course and kissed the pier. I caught her lines, then met the crew. I was impressed: They looked well into their 70s. (Alice later told me Henry was 92. She didn’t mention her own age!)

Later we were on shore and I noticed a commotion at our boat. Our dog, a three-year-old Weimaraner, had spied her Frisbee in the dinghy tied alongside. She jumped down to get it. That worked fine, but when she tried to jump back the dinghy moved sideways and she ended up in the water. She came up in a great panic, Frisbee forgotten, and thrashed her

way over to the dock edge, pawing the timbers uselessly, water splashing everywhere.

I saw Henry stand up in his cockpit and peer over. He stepped onto the pier and went over to the dog. Then he went down on one knee, extended a still-brawny arm, reached wayyy down, and lifted 50 lbs of struggling

wet Weimaraner onto solid ground. He did it in one smooth easy motion, with no strain, then stood up, shook the water off his big hands, and roared with laughter. I heard it from shore.

Then he walked back to CHAMPION. At 92 years of age.

Dave Hadfield
via e-mail



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Of Mollusks and Crustaceans

For reasons now lost to time, a scattering of plantings of the Australian turpentine tree (*Syncarpia glomulifera*) were established in Hawaii during the first decade of the 20th century. In 1947, some of these trees, by then nearly 40 years old, were harvested by C.H. Edmondson of the Bishop Museum in Honolulu. He knew that the wood of the turpentine tree had a reputation for having very high resistance to attack by marine borers in tropical marine environments.

Test blocks of heartwood from the Hawaiian trees were paired with blocks from trees that had grown in Australia. After submersion in Honolulu Harbor for two years, the Australian wood revealed only sporadic and "very light infestation by teredos, and damage by *Limnoria* was almost negligible." By comparison, within nine months to a year the Hawaiian-grown heartwood blocks were riddled by both teredos and *Limnoria* (*Tropical Woods*, 92:44-47, 1947).

So far as I know, this study was not followed up with further tests with older Hawaiian turpentine trees. Why were the Hawaiian trees so susceptible to marine borer attack? Did they grow too fast? Were soils sufficiently different from native soils that the trees were chemically different? We don't know; but this serves as one more cautionary tale supporting the contention that trees grown in exotic locations often lack the properties of native stock.

Recently, Peter Kass of John's Bay Boat Co. in South Bristol, Maine, sent me a note requesting a recommendation for "a marine borer-proof species of hardwood to use for shaftlogs in a 42' powerboat." He indicated that he had "good access to some

iroko, which is nasty to humans but I don't know about worms."

Not having touched on marine borers for a long time, I spent several days mining my library and the Internet. First, I should point out that no wood is "marine borer-proof." Even the heartwood of the turpentine tree—arguably the most resistant of all woods to marine borer attack—will suffer some damage in tropical marine environments. Any submerged portion of a boat exposed to conditions where marine borers are present needs additional barrier protection in the form of preservative impregnation, copper sheathing, fiberglass overlay, or bottom paint. The advantage of using a marine borer-resistant wood is that if some portion of the barrier system fails, the damage to the wood should be minimal between routine haulouts.

The Troublemakers

Marine borers are classified as mollusks or crustaceans. The most destructive to boats are the worm-like mollusks in the genera *Teredo* and *Bankia*, collectively called shipworms. They attach to a boat as free-swimming larvae and then develop a new form with boring shells. Entrance holes are small but interior wood can be completely honeycombed.

Another group of destructive mollusks are the phloids, primarily species of *Martesia*, but also *Xylophaga*. These organisms closely resemble clams, being enclosed in double shells. They can do considerable damage in tropical waters. In the United States, they are mostly found in the Gulf Coast region, San Diego, and Hawaii.

Marine Wood Borer Ratings

Scientific Name	Avg. Specific Gravity	Origin	Trade Name	Marine Borer Resistance
<i>Afzelia</i> spp.	0.67	Africa	afzelia	resistant to teredo but not phloids
<i>Bagassa guianensis</i>	0.68	Trop. Amer.	tatajuba	slight
<i>Caryocar</i> spp.	0.67	Trop. Amer.	piqui, caqui	moderate
<i>Chlorophora excelsa</i>	0.55	Africa	iroko	good
<i>Couratieri pulchra</i>	0.50	Trop. Amer.	taury, mabout	fair
<i>Cylicodiscus gabuensis</i>	0.80	Africa	okan	good
<i>Cynometra alexandra</i>	0.74	Africa	muhimbi	some positive reports
<i>Dicorynia guianensis</i>	0.65	Trop. Amer.	angelique	good
<i>Erythrophleum ivorensis</i>	0.72	Africa	missandra	good local reports
<i>Eschweilera</i> spp.	0.62–0.95	Trop. Amer.	manbarklak, black kakaralli	high
<i>Eucalyptus marginata</i>	0.68	Australia	jarrah	fair to good
<i>Eusideroxylon zwageri</i>	0.86–0.92	S.E. Asia	borneo, ironwood, belian	high
<i>Hyeronima laxiflora</i>	0.65	Trop. Amer.	suradan, pilon	high
<i>Lecythis paraensis</i>	0.61–0.93	Trop. Amer.	sapucaia, monkey pot	moderate
<i>Licaria</i> spp.	0.64–0.91	Trop. Amer.	marishballi, anaura, kanta	high
<i>Lophira alata</i>	0.90	Africa	ekki, azobe	good
<i>Nauclea diderichi</i>	0.63	Africa	opepe	good
* <i>Ocotea roddiae</i>	0.80–0.91	Trop. Amer.	greenheart	high
* <i>Ocotea rubra</i>	0.52–0.59	Trop. Amer.	determa	slight
<i>Parinari</i> spp.	0.64–0.72	Trop. Amer.	alomoradan, burada	good
<i>Syncarpia glomulifera</i>	0.70	Australia	turpentine	outstanding
<i>Tabebuia guayacan</i>	0.85–0.97	Trop. Amer.	guayacan	good in Panamanian waters
<i>Tectona grandis</i>	0.55	S.E. Asia	teak	slight
<i>Vouacapoua americana</i>	0.79	Trop. Amer.	acapu, wacapou	good in Panamanian waters

* Recently this genus name of *Ocotea* has been changed to *Chlorocardium*.

The crustacean marine borers—related to lobsters and shrimps (but not so tasty)—have a different mode of attack. Rather than hiding extensive damage behind tiny surface holes, these soon become exposed for all to see. Two genera, *Limnoria* and *Sphaeroma*, compose the wood-gobbling crustacea. *Limnoria* create very shallow tunnels that are easily eroded by water motion or abrasion by debris, exposing riddled wood. Commonly known as “gribbles,” *Limnoria* continue to burrow deeper as their tunnels become exposed. Because surface erosion is often greatest at the tide line, marine pilings develop an hourglass shape where gribbles are present.

Sphaeroma can cause damage similar to that produced by *Limnoria*, but these crustaceans are not as plentiful as *Sphaeroma*. However, where present, they can cause significant damage. Another risk from this group is that they occasionally sneak into fresh water.

Resistance Levels

Finding useful information about which woods are resistant to marine borers seems to fall somewhere between locating lost pirate treasure and winning the national lottery. As you delve into the subject, you find that unlike the study of decay resistance of wood, large-scale exposure tests are nonexistent. Rather, the findings of limited tests, sometimes in a single harbor with a few wood species, are the best one can hope for. So ratings tend to be based on either some limited tests or reputations gleaned over time from extensive exposures of boats, docks, or other marine structures (see table).

Based on this less-than-ideal collective experience, some general observations have surfaced. Many woods that have

good marine borer resistance contain high silica content combined with high density. But these combined do not always confer borer resistance, so other chemicals in the wood are likely important. And there are woods with only moderate density that have good marine-borer resistance, iroko being one example. In some cases, woods that have not fared well in a wide spectrum of marine situations have tested well in limited “harbor tests” (*Tabebuia guayacan* and *Vouacapoua americana*). This may be a consequence of these woods having only resistance to a few local marine borers.

Resistance to marine borers is sometimes widespread within a genus (i.e., *Licaria* and *Eschweilera*), while in other cases two closely related species will have quite different marine borer resistance (*Ocotea rodiaei* vs. *Ocotea rubra*).

The table lists 24 woods for which I could find some general agreement about marine borer resistance. I have indicated the level of resistance, which can range from “slight” to “outstanding,” using the words supplied by the reference sources—recognizing that they are very imprecise designations.

In my sleuthing, I found a few other woods that seem to have marine borer resistance, but these woods are only locally available in remote tropical locations. If you should find yourself in need of repair in some out-of-the-way tropical port, you may have to rely on local wisdom—which could be just as reliable as the collective wisdom I have compiled here. 🦋

Dr. Richard Jagels is an emeritus professor of forest biology at the University of Maine, Orono. Please send correspondence to Dr. Jagels by mail to the care of WoodenBoat, or via e-mail to Senior Editor Tom Jackson, tom@woodenboat.com.

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COURTESY PLIMOTH PLANTATION (BOTH)



For wooden ships, the mission continues

by Tom Jackson

As I write in early May 2015, the very accurate reproduction of Lafayette's 1779 flagship L'HERMIONE was crossing the Atlantic from France to the United States amid great fanfare. By the time you are likely to hold this issue in your hands, the frigate will be more than midway through her tour of the Eastern Seaboard. Seventeen years in construction, she warrants celebration, to be sure (see WB No. 244), but she calls to mind other ships of other times in more ways than one.

Even as L'HERMIONE sailed, an English-built ship that made a similar celebrated crossing as a gesture of friendship in 1957 was concluding the first round of the most extensive repairs she has had since launching—the “end of the beginning,” you might say. She is, of course, MAYFLOWER II, built in Devon in 1956 following the best understanding of Elizabethan ship construction. She set forth for Plymouth, Massachusetts, to be presented to the Plimoth Plantation historical museum as a token of British-American friendship in the aftermath of World War II. MAYFLOWER II was one of the

Above—During the winter of 2014–15, MAYFLOWER II of Plimoth Plantation, Massachusetts, was hauled out at Mystic Seaport Museum, Connecticut, for the first round of a projected \$6.5 million restoration, the most extensive since her launching in 1956. **Inset**—Removing planks allowed a close inspection of oak frames, just as removing ballast allowed access to lower hull timbers. A thorough survey will inform a three-year repair strategy to have the ship ready for 2020, marking the 400th anniversary of the Pilgrim voyage.

great success stories in maritime historical re-creation, and she remains so today.

MAYFLOWER II herself had a precursor: a beautifully built reconstruction of the famous Gokstad ship, built about 850 A.D. and recovered from a burial mound in Norway in the 1880s. The reconstruction, VIKING, sailed to Chicago in 1893 for the storied World's Columbian Exposition. She was a gesture of friendship, a nod to the Scandinavian diaspora, and not-so-slyly made the case—later proven beyond all doubt—that Norse voyagers reached the New World long before Columbus. Long neglected, she has been saved, cleaned, and stabilized under cover in Geneva, Illinois, and a “friends” organization hopes to see her suitably restored and given a permanent home.

Such reconstructions now qualify as historical artifacts.

MAYFLOWER II's horizon is filled with the prospect of the 400th anniversary of the 1620 founding of Plymouth Colony. Her captain, Whit Perry—officially Plimoth Plantation's Director of Maritime Preservation and Operations—oversees the restoration. During the winter of 2014–15, she was hauled out at Mystic Seaport's Henry B. duPont Preservation Shipyard. Plimoth Plantation hopes if possible—and that's a big “if”—to keep her in the water during summers, returning to Mystic for work over three more winters.

“What we found,” Perry said, “was exactly what you would expect of a ship 60 years old that has had pretty good maintenance.” In 2012, during a routine U.S. Coast Guard inspection, some copper sheathing installed as a stopgap measure along her waterline was removed for a closer look at the hull. “That opened up a can of worms, and they found that there was significant deterioration in the aft quarter on the port side,” Perry said. It was the proverbial wake-up call.

Ahead of a close look by marine surveyor Paul Haley of G.W. Full & Associates, all ballast was removed, much of it for the first time since launching. “We took off lots of planks in strategic areas to see the frames, so we could go in with our eyes wide open,” Perry said. There were surprises both good and bad. Wharf bore beetles—concerning, but not as destructive as teredo worms—were combated with borate sprays but had damaged the bilge stringers, which were already deteriorating. One positive surprise was the good condition of the wrought-iron fastenings, including keelbolts, which should get the attention of any ship historian. “Some of the fastenings we pulled out of the planks, the condition is just fantastic. We're amazed at how well that wrought iron has held up.”

But the hull is tired. “There's definitely a good amount of stem and sternpost work,” Perry said. “The inner keelson is going to need a lot of work,” in addition to the bilge stringers. “A lot of what we found was no surprise, but the whole ship has aspects that are rotten and need restoration; it's very widespread: futtocks, planking, topsides, bottom, rigging.... We're working very diligently on coming up with a proper plan for a comprehensive and cohesive approach.” Repairs and restorations in the past were done as needed with resources available. The necessarily thorough current project is expected to cost \$6.5 million, aided by a \$2 million appropriation from the Commonwealth of Massachusetts. (Fundraising continues.)

To Perry, the ship's modern history is as compelling as the Pilgrim story she tells. Historian William Avery Baker, then on staff at the Massachusetts Institute of Technology, researched the ship thoroughly and drew meticulous plans. “To come across some of Baker's original stability curves and things, in pencil, all calculations done without a computer—it's pretty cool,” Perry said. The plans are being scanned for the Hart Nautical Collections at MIT. Seafaring historian Alan Villiers was MAYFLOWER II's skipper for the ocean passage. The work by Baker and Villiers, luminaries in maritime history, still stands up to scrutiny and probably always will.

It is a testament to MAYFLOWER II that 58 years after her voyage she is still on the

job at Plymouth, interpreting history for some 300,000 people every year. VIKING, too, still has a fighting chance for a future a century and a quarter after her crossing. Both survive even as the spectacular newcomer sails by in the full blush of her shining moment. Soon, L'HERMIONE, too, will settle in to fulfill her role as the center of attention at the impressive naval dockyards at Rochefort, founded in the 1600s, and probably occasional sailings. Fifty years from now, she, too, will face the day when a plank is removed only to uncover problems that only skilled shipwrights can put right.

Europe has saluted the New World multiple times, as these exquisite ships from 850, 1620, and 1779 show, each with a clear purpose. Each has celebrated maritime history with care for authenticity and detail. Each is a gift to the future—but only if the future cares enough to receive them.

Tom Jackson is WoodenBoat's senior editor.

Around the yards

■ The largest boatbuilding project that Sausalito, California, has seen in decades is in frame, John Skoriak reports from the Bay Area. Planking is proceeding on **MATTHEW TURNER**, a 100' LOD brigantine being built by the nonprofit organization Educational Tall Ship in partnership with the sail-training organization Call of the Sea, which will operate the vessel and its educational program after launching.

Laminations of Douglas-fir are used extensively throughout the hull, using wood donated by the Conservation Fund, which has 80,000 acres of sustainably grown forests in Northern California. “The MATTHEW TURNER is a Forest Stewardship Certified project,” Skoriak writes, “and as far as we know, the only FSC-certified boatbuilding project in North America.” The epoxy-laminated frames were fastened to the sheer clamp with $\frac{3}{4}$ " $\times$ 18" silicon-bronze bolts. The 10" $\times$ 7½"



The hull framing for the brigantine MATTHEW TURNER, 100' on deck, was completed by December 2014, when a full view of her shape was possible before the planking scaffolding encased her. The sail-training vessel is based on a 19th-century ship built by her namesake, a noted San Francisco Bay Area shipbuilder.

JOHN SKORIAK

sheer clamp was laminated in place, followed by deckbeams 5½" × 8", increased to 12" in way of the masts. The deck is four layers, the first being tongue-and-groove Douglas-fir visible from the interior. Next came two layers of ¾" marine plywood, held by epoxy and silicon-bronze screws. The deck's final planking, 1½" × 3½" Douglas-fir, will later be vacuum-bagged in place, with seams payed with caulk.

Hull planking began in mid-April, using 3"-thick Douglas-fir fastened with ⅝" × 6" silicon-bronze lag screws and caulked with cotton topped with seam compound. Skoriak said that portion of the project should be finished by midsummer. Bronze floors and maststeps were made by a Sausalito metalworker and lead ballast keel sections were cast in Seattle, Washington. Other metalwork, including four steel watertight bulkheads, is being fabricated on site. "The depth of experience in our mostly volunteer crew is amazing," Skoriak wrote. "I have never seen a harder-working or more experienced group of dedicated volunteers. We figure that it will eventually save the project at least \$1 million in labor, of a total projected cost of \$6 million. We don't even know where all of them came from, but all of a sudden we had the biggest concentration of experienced hands I've ever seen assembled for a project like this."

The design, by Tri-Coastal Marine of Richmond, is based on a 19th-century ship by Bay Area builder Matthew Turner, for whom the brigantine is named. She will join the steel-hulled SEAWARD, 82' LOD, to more than double Call of the Sea's education program. A February 2016 launching is planned.

For information, *Educational Tall Ship*, 2330 Marinship Way, No. 150, Sausalito, CA 94965; 415-886-4973; www.educationaltallship.org. See also www.callofthesea.org.

■ A projected **two-year refit** of the **N.G. Herreshoff-designed New York 40 MARILEE** is under way at **French & Webb in Belfast, Maine**. Now owned by MARILEE NY 40 Racing LLC, the 59' LOD yacht (with a 40' waterline length), was launched in 1926. She will undergo hull renewal in the first year, continue racing during the 2015 season, and return to the yard for a new deck, interior refit, systems, and spars in the fall, to be completed in time for racing again during the 2016 season.

Camille Conover, an owners' representative, writes that during the recent work most of the hull planking was saved. The hull is double-planked above the turn of the bilge and single-planked below, and only three of the single-thickness planks were replaced, using mahogany. In way of the double-planking, cypress was used for the inner planks and longleaf pine for the outer planks where necessary. About 70 percent of the original planking was retained. The steam-bent oak frames, too, were retained, but five new white oak floor timbers were installed in way of the maststep. More floor timbers—13 of them—have been replaced aft. A new maststep was made, using a "sandwich" of bronze plate and oak to more effectively spread mast loads (see WB No. 190), as recommended by Herreshoff restoration specialist Ed McClave of MP&G in Mystic, Connecticut, who is a project consultant. The hull was also refastened, using silicon-bronze screws with long shanks to most effectively secure planks to frames—another recommendation by McClave. MARILEE will be fitted with a new rudder and tiller steering, which was one of the original options for the yacht and one preferred by many racing sailors. She'll be given a new Volvo Penta engine. An interior refit will follow Herreshoff styling but with upgraded electronics, including new navigation equipment and racing software. A June relaunching was expected.

Next year's deck reconstruction may use teak planking instead of the original pine. Her new mast will be hollow and



COURTESY OF AMANDA GREEN

During the N.G. Herreshoff-designed New York 40 MARILEE's refit at French & Webb in Belfast, Maine, most of her original hull planking was saved. She was expected to relaunch in time for the 2015 sailing season, then to be hauled out again in the fall for a second phase of restoration.

made of Douglas-fir, and her gaff, staysail boom, and main boom will be of Sitka spruce.

French & Webb, Inc., 21 Front St., Belfast, ME 04915; 207-338-6706; www.frenchwebb.com.

■ The **Moore's Marine Yacht Center in Beaufort, North Carolina**, is nearing the completion of a hull restoration project for **GRACE**, a **1913 motoryacht** built at New York Yacht, Launch & Engine Co. in Morris Heights. The doubled-ended yacht, 60' LOA with a beam of 12' 1" and a draft of 3' 6", has been owned by Montage Resort's Inn at Palmetto Bluff in Bluffton, South Carolina, since 2004. The current round of restoration has involved significant work on hull structure and planking. Work to repair the backbone included the installation of a new lower portion of the keel, along with new timbers for the keelson, shaftlog, and horn timber, all fastened with new keelbolts. Bearding surfaces to receive plank lands were restored and new worm shoe pieces installed. New laminated white oak frames replaced steam-bent ones, and new white oak floor timbers went in as well. For the structural pieces of the hull, white oak from the Ohio Valley was used,

GRACE, a double-ended 60-footer of 1913, is nearing completion of a hull refit and engine overhaul at Moore's Marine Yacht Center in Beaufort, North Carolina. By summer, she'll return to excursion work at a resort in Bluffton, South Carolina.



ROBIN JETTINGHOFF

GETTING STARTED IN BOATS

from the Editors of WoodenBoat Magazine



Volume 52

An Inboard Power Primer

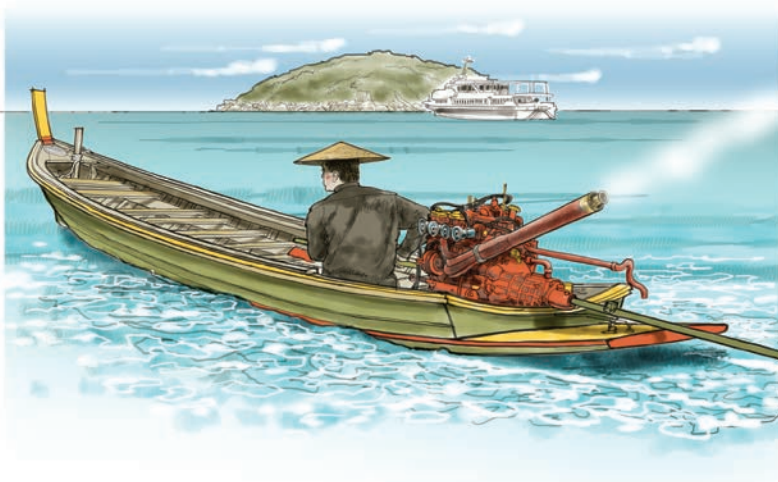
AN INBOARD POWER PRIMER

Text and Illustrations by Jan Adkins

When boats began using internal-combustion engines at the turn of the last century, we began to put holes in hulls. Today, an inboard-powered motorboat or a sailboat with an auxiliary engine must be

engineered to keep a dry inner hull while sending power to the wet outside—right through the hull. Vibration, wear, torque, and corrosion conspire to break the best mechanical schemes that separate engine power from the water.

Your boat's ability to project power from a dry motor to a wet outside depends on an interlocking set of systems that begins at the fuel filler cap and ends in the wake of your boat. Here, we'll introduce the parts of the drivetrain—the system that begin where the engine ends—and we'll also examine some important supporting systems (fuel, and the combined exhaust and cooling systems) that also require holes in the hull.



One rough but resourceful solution to the problem of transmitting power without compromising the hull is the Southeast Asian “longtail” drive shown in the illustration above. It’s an engine—whatever’s available, apparently—mounted on an improvised pivot at the wide, load-carrying stern of a shallow-draft native craft. The long driveshaft, sometimes stiffened by an exterior shaft rigged with spreaders and shrouds, turns a large propeller with a protective bent skeg. These thin-water skimmers howl along canals and rivers into surprisingly shallow stretches and even up onto the beach. They would probably not be USCG approved.

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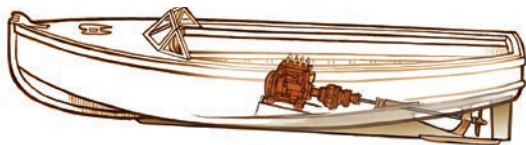
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DRIVE GEOMETRY: VARIATIONS ON THE THEME

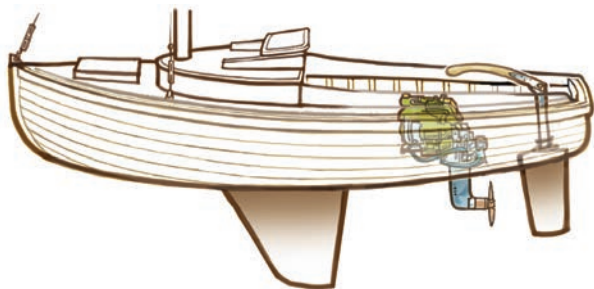
Engine propulsion can be transmitted from the engine to the propeller in one of several basic formats.



Outboard Motor in a Well. Some workboats and fishing boats have an outboard motor hidden in a well, rather than hanging on the transom. This places the outboard's propeller closer to the turning pivot of the hull and farther from loose lines and obstructions. Many sailboats and pleasure boats tuck an outboard motor in a covered well aft so the motor noise is reduced, fittings and fuel lines are out of the way, and a more traditional look is preserved.



Inboard Driveshaft through a Skeg. This configuration is the common and robust solution to inboard power. It demands a well-aligned, well-sealed driveshaft to prevent leaking.



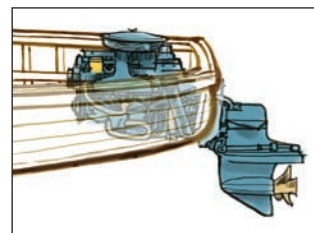
Saildrive. This vertical-shaft assembly is for fin-keeled sailboats; it's compact and effective with its weight balanced toward amidships.



Inboard V-Drive. This space-saving configuration is employed when interior layout limits the engine placement forward, or hull shape denies shallow shaft angle.



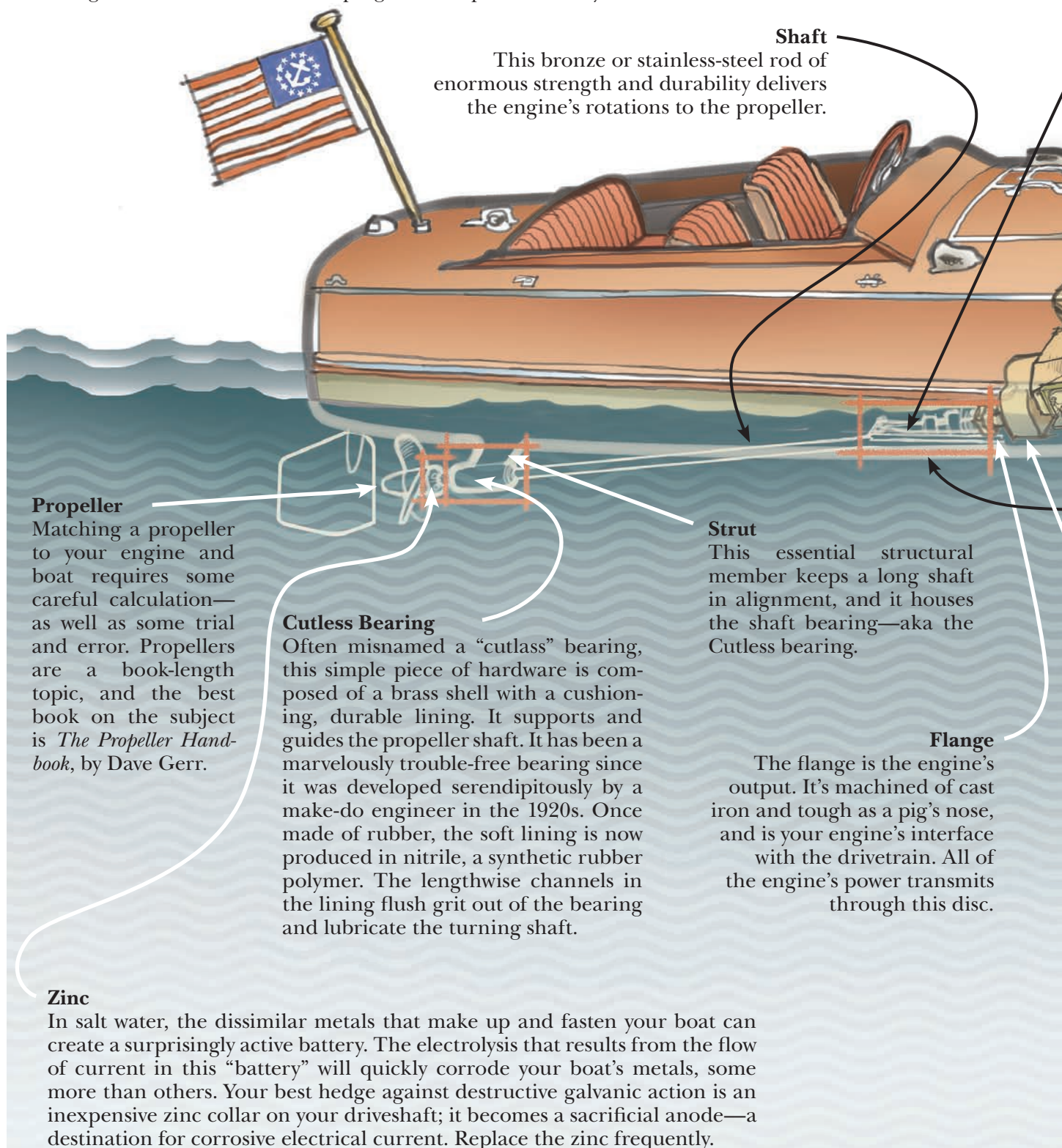
Inboard/Outboard Sterndrive. In this scenario, an inboard engine powers an articulating outboard-style propeller assembly through the transom. It offers the power and inboard balance of an inboard motor with the directional thrust (and, hence, nimble steering) of an outboard.



Jet Drive. Once an exotic device, the jet drive is now commonplace. It ducts water through an impeller to exit at great force through a nozzle. It's most common in PWCs (personal watercraft, or jet skis) but it's also found in larger boats. Some resourceful builders have torn the guts out of PWCs and placed them in more traditional designs.

ANATOMY OF AN

A classic runabout's drivetrain is laid out with attention to lubrication, corrosion, watertightness, and vibration damping. Critical parts of the system are:



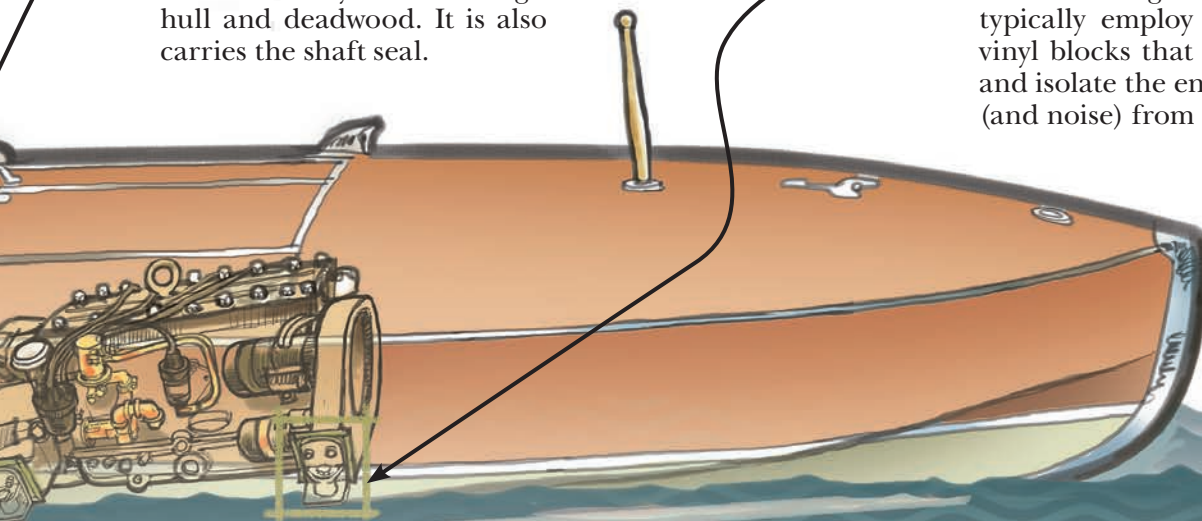
INBOARD INSTALLATION

Shaftlog

This bronze or stainless-steel casting caps the interior end of the shaftway bored through hull and deadwood. It is also carries the shaft seal.

Motor Mounts

These rugged bits of hardware fasten the engine to the hull, and typically employ hard rubber or vinyl blocks that absorb vibration and isolate the engine's pulsations (and noise) from the hull.



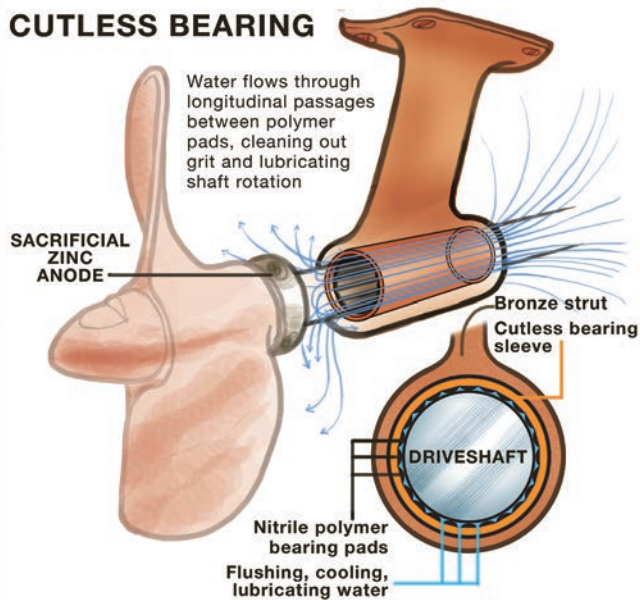
Shaft Seal, Stuffing Box, or Gland

The stuffing box is the time-honored device for sealing the shaft as it enters the hull through the deadwood or keel. Wax-and-linen compression rings are tightened to allow a controlled, slow drip (about two drips per minute). The stuffing box has largely been replaced by “dripless” seals that depend upon precise tolerances and synthetic materials (these are covered in more detail on page 6).

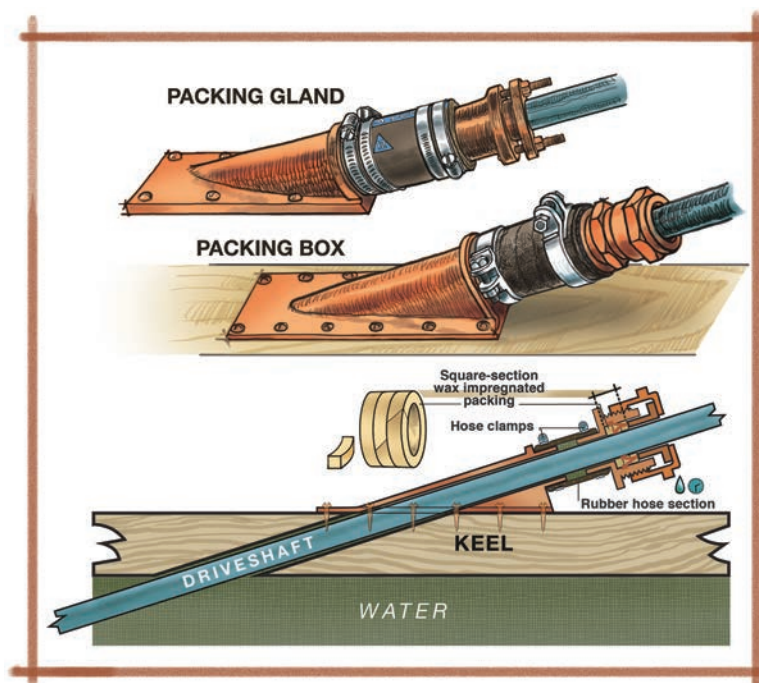
Gearbox

The gearbox is the equivalent of a car's transmission, as it uses gears to reduce the engine's revolutions per minute (rpm) to a lesser rotation for the shaft's rpm. Unlike a car, however, a boat's gearbox does not shift through multiple gears; rather, it maintains a constant ratio of engine speed to shaft speed. The gearbox may also reverse the propeller's rotation for “backing down” or moving aft.

CUTLESS BEARING



TYPES OF SHAFT SEAL

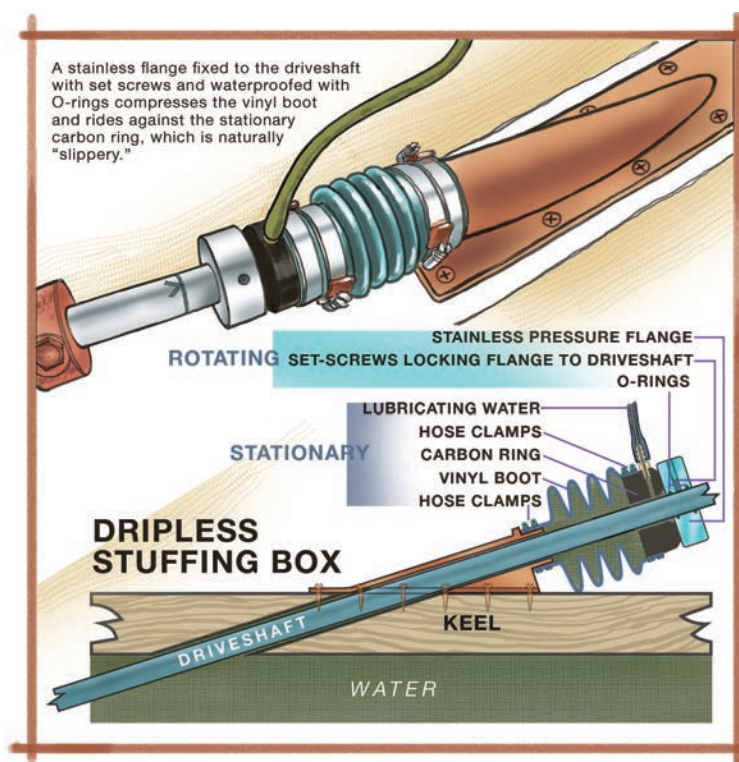


The traditional stuffing box, or packing gland, begins with a vibration-isolating rubber hose clamped around the shaftlog and around the stuffing-box assembly. The stuffing box itself employs three or more square-sectioned cords of wax-impregnated linen carefully cut with a sharp blade to full-circle lengths. These rings will embrace the shaft tentatively until the packing nut is turned down to place pressure on them; this pressure will expand them slightly to exclude all but a minimal flow through the box. It's possible to overtighten the packing rings, clamping the shaft and straining the engine. The rule of thumb is sufficient packing nut pressure to allow one or two drops of water per minute. When this is achieved, the locking nut above the packing nut is tightened down for a secure and stable pressure—in theory.

The dripless shaft seal approaches the same problem as does the stuffing box, but with contemporary materials and

close machining tolerances. An accordion-style vinyl boot, or bellows, is immovably secured around the shaftlog with hose clamps. The engine side of the boot is hose-clamped around a carbon ring with a machined face. A precision-bored stainless-steel ring fitted to the propeller shaft with internal rubber O-rings is drawn down aft along the shaft until its machined face meets the carbon ring's face. A mark is placed on the shaft just above the stainless ring. From this marked position, the stainless ring is pushed farther aft, compressing the vinyl boot by a depth specified by the manufacturer. At this new mark the stainless ring is secured to the shaft with Allen screws and Allen screw lock-followers. The stainless face of the ring rides

with minimal friction against the carbon's naturally slippery surface. Some dripless shaft seals are plumbed to allow engine-cooling water to flow through them.

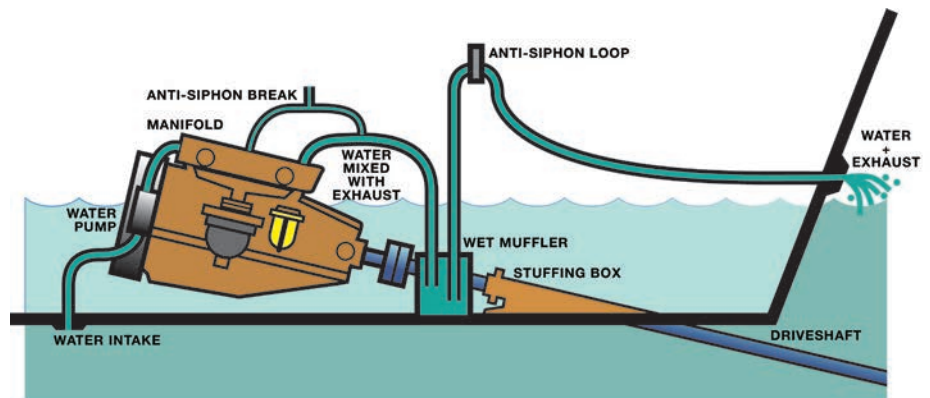


COOLING/EXHAUST SYSTEMS

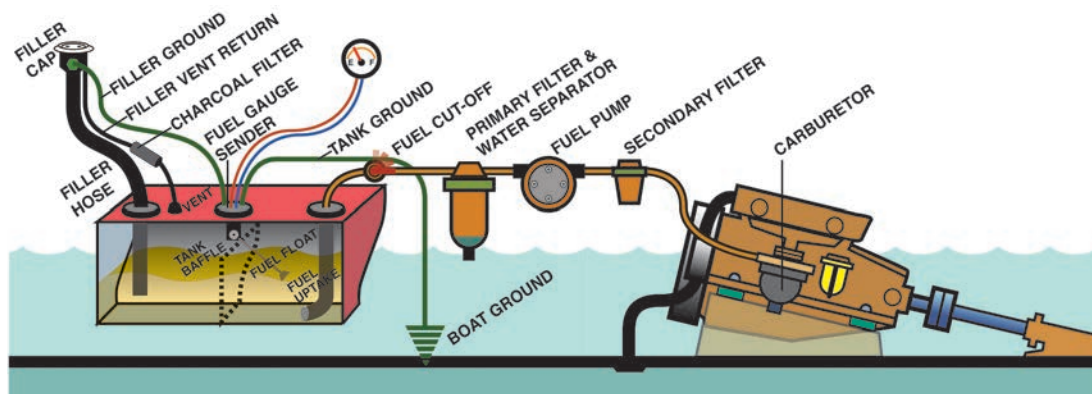
Inboard engines are typically cooled by one of two means. The first involves seawater flowing directly through them, and then being discharged along with the exhaust. It's an effective but rust-inducing system that limits the life of the engine. The second method is an evolution of this so called raw-water cooling: It uses a heat exchanger to carry heat away from the engine's coolant, in much the same way that a car's radiator cools its engine. The raw water then flows from the heat exchanger to the muffler, and is pumped overboard along with the engine exhaust.

The end result of both systems is the same: a cooled engine and a wet exhaust. Basic physics comes into play when we introduce water into the exhaust line: the water cools the exhaust and subdues sound

energy pulses, so exhaust mixed with water emerges from the transom as a sputtering murmur. Implementing this is a bit more complex than the basic principle because the surge and drop of a boat at sea could set up a back-siphon effect that might flood the engine—literally. Consequently, we install siphon-breaking high loops. Seawater is fed into the exhaust manifold by a raw-water pump.



FUEL SYSTEMS

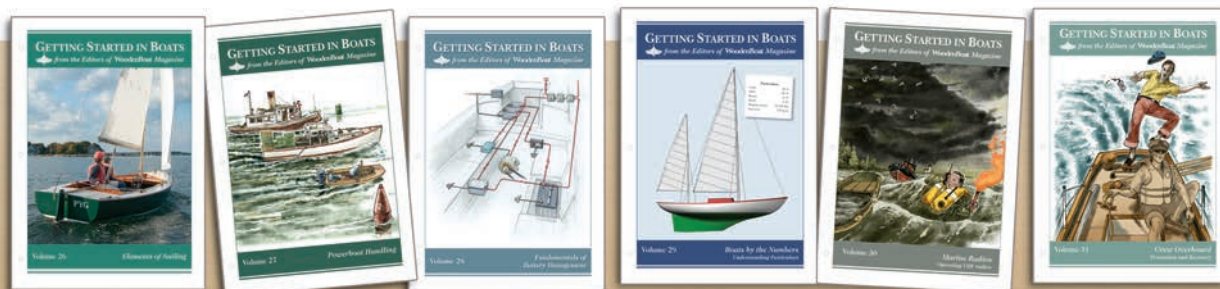
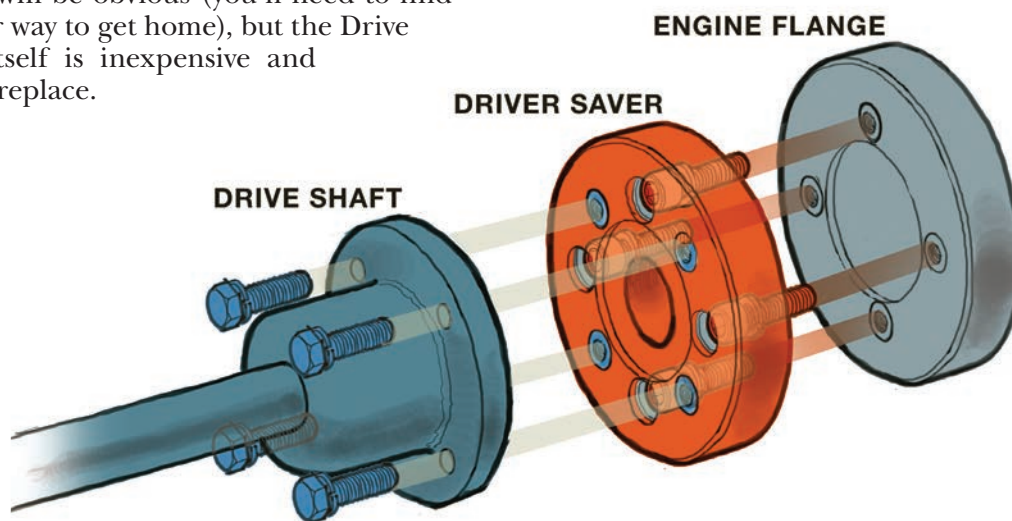
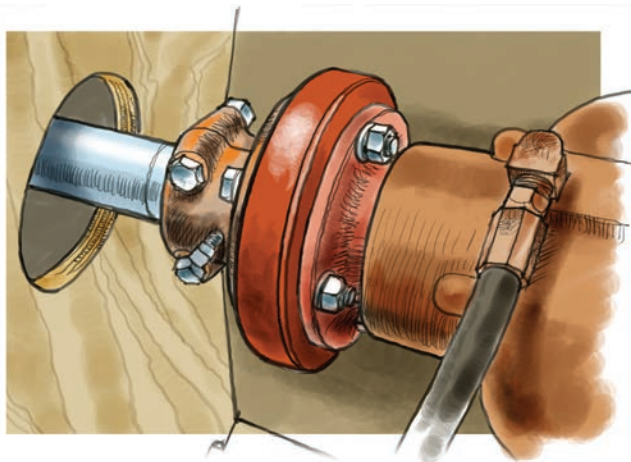


Gasoline engines are hazardous because their fuel is explosive and volatile. If you're lulled into complacency by the fact that none of your cars ever blew up, consider that they are essentially open at the bottom below the engine spaces and tanks. Ventilation occurs at any speed. In a boat, the engine and tank spaces are near-perfectly sealed and will accumulate heavier-than-air fuel vapors that could be exploded by any random spark. Note the ground wires attached to the filler and tank of this fuel system, to suppress the risk of static electricity sparks, and

note the provisions for venting fuel vapors to the air through a carbon filter. The gasoline tank may well incorporate an internal baffle to discourage "slop" at the fuel's surface, and its resultant vapor production. The fuel line itself should be secured to the boat's stable structure, immovably. Marine-grade fuel pumps are "ignition protected"—which is to say, they are engineered to not spark. The primary fuel filter is engineered to remove water from the fuel; there's often a secondary filter farther down the line to trap any sediment that gets by this first line of defense.

THE DRIVE SAVER

The Drive Saver is, like the zinc, another sacrificial lamb—but one not meant to waste away. It's a puck of vinyl isolating the engine's gearbox output flange from the driveshaft's coupling. Because it's engineered with a bit of "give" in its material, it compensates for small misalignments. Because it won't transmit current, it isolates the engine from current flowing in surrounding salt water. And because it's less hardy than the metal parts it connects, it will shear and fail before damage can be transmitted to the gearbox and engine. It may also save the propeller. Its failure will be obvious (you'll need to find another way to get home), but the Drive Saver itself is inexpensive and easy to replace.



Getting Started in Boats is dedicated to those who are new to boats and boatbuilding.

Please tear out and pass along your copy to someone you know who will be interested.

Earlier volumes of *Getting Started* are available in past issues of *WoodenBoat*, and as PDF (electronic) files, from The WoodenBoat Store, www.woodenboatstore.com

matching the original specifications. About 20 hull planks had to be replaced, using longleaf pine from North Carolina to match the originals. The hull was refastened, recaulked, and repainted. The 350-hp Caterpillar 3116 diesel engine, an earlier replacement for GRACE's original 50-hp gasoline engine, was rebuilt and reinstalled. Her systems, found to be in good order, were retained. The interior, which had to be removed for access to the structural repairs, was reinstalled, retaining the original mahogany raised-panel bulkheads and trim, and keeping the original configuration. A June relaunching was anticipated, after which the yacht was expected to resume her duties as an excursion boat and a star waterfront attraction at the Palmetto Bluff resort.

Moore's Marine Yacht Center, 1201 Sensation Weigh, Beaufort, NC 28516; 252-504-7060; www.woodenboatrepair.com. See also www.palmettobluff.com.

■ **Bob Walwork in Palmetto, Florida**, is building his **last Raveau speedboat**, we are informed by Bill Jacobs, who wrote about the builder in WB No. 219. The boat, 25' LOA, also happens to be the **largest of the boats** he has built during his long association with the work of French designer and boat-builder **Marcel Raveau**. The boat has been under construction for three years. Following the usual Raveau methods, she is framed with $\frac{3}{4}$ " clear spruce and planked in mahogany plywood glued with resorcinol and fastened with silicon-bronze ring-barb nails. "This is the flagship of all the Raveau boats I've built," he told Jacobs; "I figure this is the time to finally retire." The boat will be powered by a custom-built 300-hp Mercury Marine racing engine. Walwork first met Raveau in 1959 while working with Kiekhaefer Corporation, the maker of Mercury engines. The company had selected Raveau to develop boats for a "Round the World" endurance test conducted on a remote lake in Florida. Walwork went to work with Raveau in 1962 and continued until 1965, when Marcel retired to his native France and granted Walwork permission to continue building boats to his designs. Although Walwork soon turned to fiberglass boat construction elsewhere—and

in 1984 he started W.R. Walwork & Associates, Inc., to focus on developing performance fiberglass boats—he continued building wooden boats occasionally. At the classic wooden boat show in Mount Dora, Florida, in 1996, he entered a Raveau, which resulted in several simultaneous orders. After that, he turned to building wooden Raveaus exclusively, and he has built 33 boats since, working alone on boats between 13' and 20' long until the 25-footer, which is for a Miami client who many years earlier had Walwork build him a 16' Raveau.

Offcuts



PATRICK HOLIAN

STORMVOGEL of 1951, the last sail-powered cargo carrier built in the "ABC Islands"—Aruba, Bonaire, and Curaçao—has been brought back to the island by a group of volunteers who started a foundation to save her.

“On March 25, 2015,” Patrick Holian writes from Florida, “the freighter DOÑA LUISA arrived on the **Caribbean island of Bonaire** with the usual assortment of containers. But placed on her port side was an impressive **45' wooden hull. STORMVOGEL** was finally home. This historic boat, built under a tamarind tree on Bonaire in 1951, is the **last of the sail-powered cargo vessels** built in the ‘ABC Islands,’ the other two being Aruba and Curaçao, off the coast of Venezuela. Martin Felida commissioned the construction after securing a lucrative contract to haul propane among the islands. Ismael Soliano, 86, who served periodically as captain, told of his first time at the helm: ‘When we left Aruba, we followed the Venezuelan coast, and at the right time, made one tack north. That route took us directly to Bonaire, completing the voyage in just two days. Fast boat!’

“STORMVOGEL was later modernized with a diesel engine and registered in Curaçao. For decades, the cutter hauled goods, packages, and freight. There were also rumors of smuggling liquor and cigarettes to Venezuela. Lucio Soliano, 79, a STORMVOGEL deckhand during her sailing days, recalls hauling live goats: ‘We would load between 80 and 90 from Bonaire and deliver them to Curaçao. We would stow as many goats as we could in the hold, and tied the rest above deck.’

“In 2012, François van der Hoeven discovered STORMVOGEL slowly sinking in a Curaçao backwater. He understood the boat’s historical value and acted fast. Every week for three years, van der Hoeven pumped out the old cutter while trying to generate interest on Bonaire to save her. Last November, several Bonaire residents formed the Bonaire Maritime Heritage Foundation, contacted Martin Felida’s family, and secured ownership of STORMVOGEL. Van der Hoeven then organized a team of volunteers who removed tons of



BILL JACOBS

A 25' powerboat will be the largest Marcel Raveau-designed boat that Bob Walwork will build in Palmetto, Florida, before his retirement.



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CURRENTS

unwanted materials and prepared the boat for transfer. Johnny Craane, head of the restoration, secured free transport from a local shipper, Don Andres. A week later STORMVOGEL had arrived. 'Our next step is to carefully examine the condition of the boat,' Craane said. 'Every frame and plank will be inspected. Then we will decide what is the best future for STORMVOGEL.'

"Craane will not work alone. Bruce Halabisky, a professional shipwright and marine carpenter (and a frequent *WoodenBoat* contributor), will serve as a consultant. Local resident Lars Elsdrodt has volunteered to document STORMVOGEL's hull lines. 'We'll also be launching a Junior Shipwright program to teach kids how to build wooden boats,' Craane said. 'We are very excited to connect Bonaire's youth with their rich maritime past.'"

For information, see Facebook.com/StormvogelBonaire or email ProjectStormvogel@gmail.com.

"September 17–20, a **fleet of historic** and reproduction **racing powerboats** will meet on Lake George, New York, for the **80th anniversary of the Gold Cup** victory by **EL LAGARTO**," Reuben Smith writes from his Tumblehome Boatshop in nearby Warrensburg. "EL LAGARTO, the 'Leaping Lizard of Lake George,' driven by George Reis and his riding mechanic Anderson Bowers, porpoised her way around the course to win her third straight Cup in 1935. At the tender age of 13, and running an older, normally aspirated Packard, she was able to hold off the latest in supercharged engines and hull design. Now part of the Adirondack Museum's collection in Blue Mountain Lake, the boat remains an icon of American boating history. She is from an era when raceboats were required to be 'sensible', and have niceties such as a forward cockpit and a reverse gear. Building up to the September event, EL LAGARTO will leave the museum for the first time in 50 years. She is coming to **Tumblehome Boatshop** for a sensitive, non-destructive **refinishing**, and minor repairs and corrections. After that, she will go **on display** in Tumblehome's new showroom, where she can be visited by the public from early July until Columbus Day." For more information, see www.tumblehomeboats.com, www.lakegeorgegoldcup.com, and www.adirondackmuseum.org.

"The story of the **fish boat WESTERN FLYER** might have played an integral part in the life of Nobel Prize-winning novelist John Steinbeck, but on its own the vessel's recent history is more appropriate for a dime-store mystery, with just about as many twists and turns in her pedigree," Michael Michelsen writes from Riverside, California. "My recent article in *Currents* [WB No. 243] reported that the vessel that served as home base for Steinbeck's trip that was recounted in his book, *The Log from the Sea of Cortez*, was found and as last reported was headed toward a new home in Salinas, the property of developer Gerry Kehoe.

"But just as the issue was headed out the printer's door in February, **the boat was sold** to Martinez entrepreneur **John M. Gregg**, founder and president of Gregg Drilling & Testing, Inc. In a telephone interview, he explained his plans for the vessel: 'I will admit to being a fan of John Steinbeck's work,' he said—his favorite Steinbeck book is *Tortilla Flat*—'but that's not the reason that I bought WESTERN FLYER. I like science. I always have, and the pedigree of that vessel makes it a natural that she remain used for science applications.'

"Gregg purchased the vessel in January—and he told me he paid \$1 million for it. After a planned one-and-a-half-year, \$2 million restoration, he plans to lend her to science-oriented institutions as a **research vessel**. As of

this writing, WESTERN FLYER is still hauled out in Port Townsend, Washington. [By coincidence, a launching photo of her appears on page 45 of this issue.] 'But when I saw that progress on a restoration job wasn't getting anywhere,' Gregg said, 'I decided that I wanted to see what I could do. I had the money to buy it and I had the money to invest in cleaning it up, so I bought it. It will be a lot of work to put it in shape to see water again, but I'm confident that it still has a good frame and will clean up nicely.' At least for the time being, Gregg intends to replace much of the wooden structure of the vessel and update the existing diesel engine to a hybrid diesel-electric one. Gregg also plans to outfit WESTERN FLYER with a custom, remotely operated submersible for use by scientists and explorers.

"By purchasing the FLYER and carrying out my plan, I feel like I am giving something back to the field that I have enjoyed, and it has been very good to me," Gregg said. "And the fact that others are going to benefit from the research that they can accomplish on this historic vessel is an added benefit."

"In a small village in eastern Ontario, called Portland-on-the-Rideau, either in the late 1800s or early 1900s a gentleman by the name of **Will J. Dowsett**, who had been trained as a cooper, started building boats," Doug Good writes from that province. "Working alone, and later with his son Clare, he built boats until around 1947. Dowsett boats can still be found all over North America. As part of its **centennial this year**, a cottage organization called The Big Rideau Lake Association is planning an Antique and Classic **Boat Show** at **Portland** featuring as **many Dowsetts as we can organize**. We are therefore inviting people to bring their Dowsetts 'home' to Portland-on-the-Rideau for this one-day event, August 8. The location of the boatworks (which was demolished some years ago) and the Dowsett residence will be pointed out in village tours, and some of Dowsett's tools will be on exhibit. Dowsett boats include fine rowing skiffs, St. Lawrence guideboats, and



COURTESY OF DOUG GOOD

IDLER is an example of a boat built by Will J. Dowsett in Portland-on-the-Rideau, Ontario. Although her canopy and transmission are later add-ons, the boat is as Dowsett built her in the early 20th century, including her two-cylinder St. Lawrence engine. Doug Good—who once owned this boat, which now resides in the Gulf Islands in British Columbia—is involved in gathering as many Dowsett boats as possible together in Portland for the Big Rideau Lake Association's centennial.

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FOR MORE INFO: <http://www.larchmontyc.org>
lycclassics@gmail.com

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FOR MORE INFO: <http://www.rtrace.org>
Bill Roman: eyc@vineyard.net
Sal Giordano: salgjordano@verizon.net
Kirsten.Ferguson@MediaProNewport.com

Aug 8-9: **Corinthian Classic Yacht Regatta**
Corinthian Yacht Club, Marblehead

FOR MORE INFO: www.corinthianclassic.org
bruce.dyson@comcast.net

AUGUST

Aug 16: **43rd Annual Opera House Cup**
2nd Annual Classic Yacht Exhibition, Boat Basin (8/15 - 5:30-8pm)
Nantucket, MA

FOR MORE INFO: www.operahousecup.org
diana@nantucketsailing.org

Aug 21-23: **The Herreshoff Classic Yacht Rendezvous and Regatta**
(Includes "The Living Boat Show" on Friday)
Herreshoff Marine Museum, Bristol, RI

FOR MORE INFO: www.herreshoff.org
(Dockage avail: info@herreshoff.org)

Sept 5-6: **36th Annual Museum of Yachting Classic Yacht Regatta**
Newport, RI

FOR MORE INFO: www.MoY.org
events@iysr.edu

Sept 12: **Greenport Classic Yacht Regatta**
Greenport, NY

FOR MORE INFO: www.SailGreenport.org
Jeff Goubeaud: qmiii@aol.com

Sept 19: **Indian Harbor Classic Yacht Regatta**
Indian Harbor Yacht Club, Greenwich CT

FOR MORE INFO: www.IndianHarborYC.com
Shelia Graves: noreaster1926@yahoo.com

SEPTEMBER

Sept 26: **Heritage Cup Regatta and Rendezvous**
Hempstead Harbor Club, Hempstead Harbor, NY

FOR MORE INFO: www.Heritagecup.org
Michael Emmert: Goldenl37@aol.com

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CURRENTS

sleek launches. The Rideau Lakes were fortunate to have a number of boatbuilders in the area, not only Dowsett but also men such as Davey Nichol from Smiths Falls, Myles Jeffrey from Athens, and Albert Hull from Newboro. Although Dowsett boats are being celebrated, we look forward to displaying boats by these builders as well as wooden classics by Garwood, Shepherd, and Grenell, to name a few. And, we still have local wooden boat building and restoration, too, in the form of Wykes Boat Works of Harlem, a small hamlet in the municipality of Rideau Lakes."

For additional information, contact info@bigrideaulakeassociation.com.

More news from **Ontario:** Joe Fossey writes from Barrie that this year marks the **100th anniversary** of the patent for the lifting-propeller device that gives the name to **Dispro Boats**, for "disappearing propeller" (see WB No. 55). The actual centennial date, marking August 8, 1915, will be celebrated at Port Carling. "At a special **celebration on August 8**, a Province of Ontario heritage plaque will be dedicated at the site of the original Disappearing Propeller Boat Company plant," he writes. "The planning committee of the Dispro Owners Association has set its sights on having **100 running examples** of the Dispro and family crews on hand. The association has a great website, www.disproboats.ca, that can answer any and all questions about the Dispro Boat, including videos of events and maintenance tips for the boats, and can even put you in touch with someone who can help. A newsletter, *The Device*, is published four times per year. The association, formed in 1979, is still going strong with boats and membership but is always concerned about attracting the next generation of Dispro owners to keep all of these wonderful boats owned, maintained, and operational."

Across the bar

■ **Peter Chase**, 64, March 16, 2015, Harborside, Maine. Mr. Chase (see WB No. 232) was a native of Connecticut but had family ties to the Cape Rosier community of Harborside, where he spent summers as a youth. He never had a doubt that he eventually would live there full time. He attended North Country School in New York's Adirondack Mountains, then Putney School in rural Vermont, both private schools stressing progressive education and creativity. He went on to the Philadelphia University School of Design. Traditional boats were part of his life from his earliest years, among them the 80' schooner NATHANIEL BOWDITCH, which his brother Carl owned at the time. His enthrallment continued in Ireland, where he lived for a year in the 1960s while his wife, Sophie Spurr, whom he met at Putney School, studied at Trinity College, Dublin. There, he bought a 34' Galway Hooker, which he brought back to Maine. (Years later, after the revival of interest in the type in Ireland, the boat was returned for a thorough restoration; see WB No. 193.) The experience cemented his commitment to boatbuilding. He next enrolled at Washington County Vocational Technical Institute in Lubec to learn the craft. When his wife went on to law school in Maryland, he took up work at the Chesapeake Bay Maritime Museum in St. Michaels. After her graduation, they settled back on Cape Rosier in 1979. Mr. Chase partnered with others at Caterpillar Boatworks, which, among other things, built the Chase-designed Dirigo 17' kayak. Next, he went to work at Brooklin Boat Yard, where he stayed for 20 years. In 2008, he struck out on his own, working out of a bow-shed building next to his house. Although he often did

freelance boat work, his favorite projects involved designing and building small craft, among them a lapstrake sloop called the Cape Rosier Wherry, a Cape Rosier Guideboat that harkened back to his Adirondack days, a cradle boat inspired by his growing family, and a yawlboat. Stricken with a rare disease called frontotemporal degeneration, he continued building boats and numerous half models as passionately as ever as long as he possibly could.

■ **Alan Buchanan**, 92, January 26, 2015, St. Peter, Jersey, England. After working as an aircraft draftsman and project engineer as a young man during World War II, Mr. Buchanan started his own yacht design firm, settling at Burnham-on-Crouch, Essex. Yachts of his design won prestigious sailing races in the 1950s and '60s, and he himself raced in competitions as various as the Fastnet Race and the Sydney-Hobart Race. In 1969, he moved—with his family and design studio—to the island of Jersey, which is near the coast of Normandy, France. There, he increasingly turned to cruising designs. His early work was devoted to wooden construction, but by the 1950s he was also designing steel hulls and became an early proponent of fiberglass. He designed the first fiberglass yacht for European production in the mid-1950s, although he continued to design for wood construction. He was fast and prolific, ultimately completing more than 2,400 plans, which now reside at the National Maritime Museum Cornwall, where he readily lent his name and expertise over the years.

■ **John Cox**, 81, January 22, 2015, Eton, England. Mr. Cox spent his life building traditional rowing boats at Eton College, where he started in the trade as a 14-year-old apprentice. Many of his boats, especially in his early years, were racing shells for Eton College students, but he also built punts and rowing skiffs that have remained popular among Thames River rowing clubs to the present day. He was born only paces away from the college boathouse, and except for a few years of military service in the 1950s, he remained in Eton his entire life. He helped found the Thames Traditional Boat Society (www.ttbs.org) in 1980. He built, or had a hand in building, a number of re-creations of historically important rowing craft, among them the 1990 construction of THE ROSE, which was based on a 1781 builder's half model and was the first Thames wherry built in 150 years. After retiring from Eton College in 1998, he continued building and restoring traditional boats, and he also taught and mentored eager students, many of whom went on to celebrated boatbuilding careers in their own right. He retired—again—in 2011 at the age of 78.

■ **Brian Cumby**, 64, February 26, 2015, Cornwall, England. First trained in printmaking and sculpture at Great Yarmouth College of Art and Design, Mr. Cumby altered course to pursue interests in historic ships. He served as a shipwright on the MATTHEW project, reconstructing John Cabot's caravel of 1497 (see WB No. 130) for the New World voyage's 500th anniversary. The reconstruction was launched in Bristol in 1996 and the next year retraced the voyage to Newfoundland. Mr. Cumby also led the reconstruction of a Bronze Age hull, 40' long and built of shaped oak planking sewn together with yew withies and caulked with moss, for the National Maritime Museum Cornwall in Falmouth. The boat's construction was authentic to archaeological finds in Cornwall dating back as far as 2030 B.C., which shed new light on boats used to import tin ingots to Britain for bronze manufacture. Later, he helped build a reconstruction of a Viking-age trader for an exhibit at the museum. 

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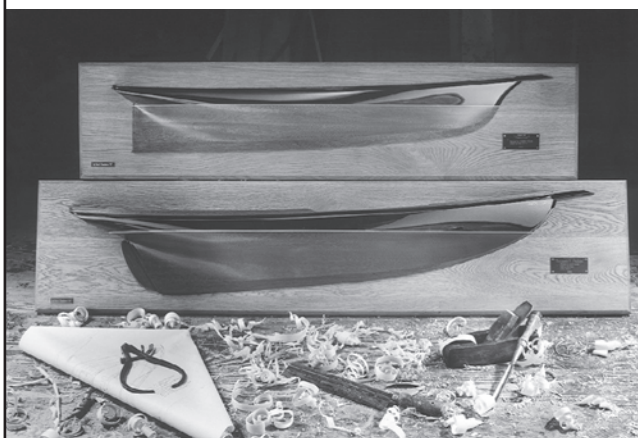
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ALUMNI WORK WEEK	ALUMNI WORK WEEK	Fundamentals of Boatbuilding with Greg Rösse		Fundamentals of Boatbuilding with Wade Smith		Fundamentals of Boatbuilding with Greg Rösse		Sparmaking with Jeremy Gage	Fundamentals of with
		Making Friends with Your Marine Diesel Engine with Jon Bardo	Build Your Own Annapolis Wherry with Geoff Kerr	Fine Strip-Planked Boat Construction with Nick Schade	Build Your Own Stitch-and-Glue Kayak with Eric Schade	Build Your Own Baidarka with Mark Kaufman	Building Beach Pea with Geoff Kerr		Traditional Wood-and-Canvas Canoe Construction with Rollin Thurlow
		Glued-Lapstrake Plywood Construction with John Brooks	Finishing Out Small Boats with Bill Thomas	Boatbuilder's Hand Tools with Harry Bryan	Boatbuilder's Hand Tools with Harry Bryan	Introduction to Boatbuilding with John Karbott	Build Your Own Plank Constructed Pond Yachts with Thom McLaughlin	Marine Painting and Varnishing with Gary Lowell	Introduction to Woodworking with Bill Thomas
				Blacksmithing for Boatbuilders with Doug Wilson	Lofting with Greg Rösse	Elements of Sailing for Women with Jane Ahlfeld and Annie Nixon	Elements of Sailing with Sue LaVoie and Rich Naple	Vintage Pond Yachts Part II with Thom McLaughlin	Elements of Boat Design with John Brooks
				Coastwise Navigation with Jane Ahlfeld	Elements of Sailing with Jane Ahlfeld and Annie Nixon	Skills of Coastal Seamanship with Andy Oldman	Craft of Sail on TAMMY NORIE with Joel Rowland	Seascape/Landscape in Watercolor with Paul Trowbridge	Bronze Casting for Boatbuilders with Michael Saari
							Elements of Sailing with Martin Gardner and Sue LaVoie	Elements of Sailing II with Martin Gardner and Robin Lincoln	
							Craft of Sail on ABIGAIL with Hans Vierthaler	Craft of Sail on MISTY with Queenie Foster	
								Coastal Cruising Seamanship on ABIGAIL with Hans Veirthaler	



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26 – 1	2 – 8	9 – 15	16 – 22	23 – 29	30 – 5	6 – 12	13 – 19	20 – 26
Boatbuilding Warren Barker	Fundamentals of Boatbuilding with Thad Danielson		Traditional Lapstrake Construction with Geoff Burke		Fundamentals of Boatbuilding with Greg Rösse		Fundamentals of Boatbuilding with Wade Smith	
Build Your Lapstrake Dinghy with John Harris	Building the Simmons Sea Skiff with Bob Fuller		Stitch-and-Glue Boatbuilding with John Harris	Build Your Own Northeast Dory with George Krewson	Introduction to Cold- Molded Construction with Mike Moros	Building a Dory with Graham McKay	Build Your Own Pinguino 145 Kayak with Bill Thomas	Making Friends with Your Marine Diesel Engine with Jon Bardo
Woodcarving with Reed Hayden	Building a Nordic Pram with F. Jay Smith	Introduction to Boatbuilding with John Karbott	Scratch Modelmaking with Steve Rogers	Fine Strip-Planked Boat Construction with Nick Schade	Introduction to Boatbuilding with Bill Thomas	Glued-Lapstrake Plywood Construction with John Brooks	Finishing Out Small Boats with John Brooks	Building Half Models with Eric Dow
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Paddle, Pedal and Row with Mike O'Brien	Elements of Sailing for Women with Jane Ahlfeld & Gretchen Snyder	Metalworking for the Boatbuilder & Woodworker with Erica Moody	Elements of Sailing with Jane Ahlfeld and Rich Naple	Craft of Sail on MISTY with Queene Foster	Sea Sense Under Sail with Havilah Hawkins	Sea Sense Under Sail with Havilah Hawkins		
Sailing Downeast with Andy Oldman	Sailing the Friendship Sloop with David Bill	Elements of Sailing with Andrew Breece and Rich Naple	The Catboat with Martin Gardner	Elements of Coastal Kayaking with Mike O'Brien	Coastal Cruising Seamanship with Hans Vierthaler	Advanced Coastal Kayaking with Stan Wass		
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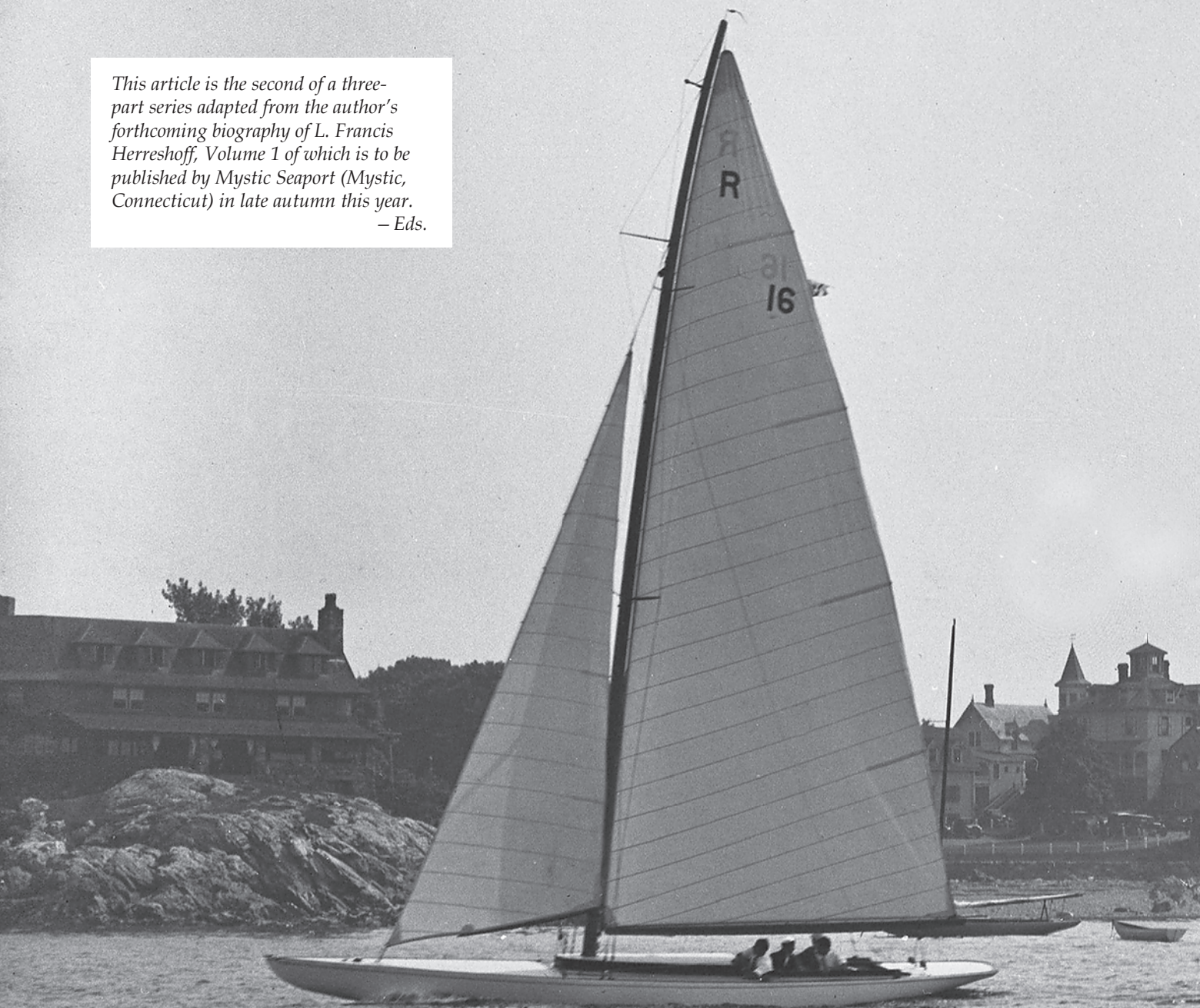
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This article is the second of a three-part series adapted from the author's forthcoming biography of L. Francis Herreshoff, Volume 1 of which is to be published by Mystic Seaport (Mystic, Connecticut) in late autumn this year.

—Eds.



Seamarks: Three Pivotal Designs by L. Francis Herreshoff

Part Two: YANKEE and LIVE YANKEE, Two remarkable R-boats

by Roger C. Taylor

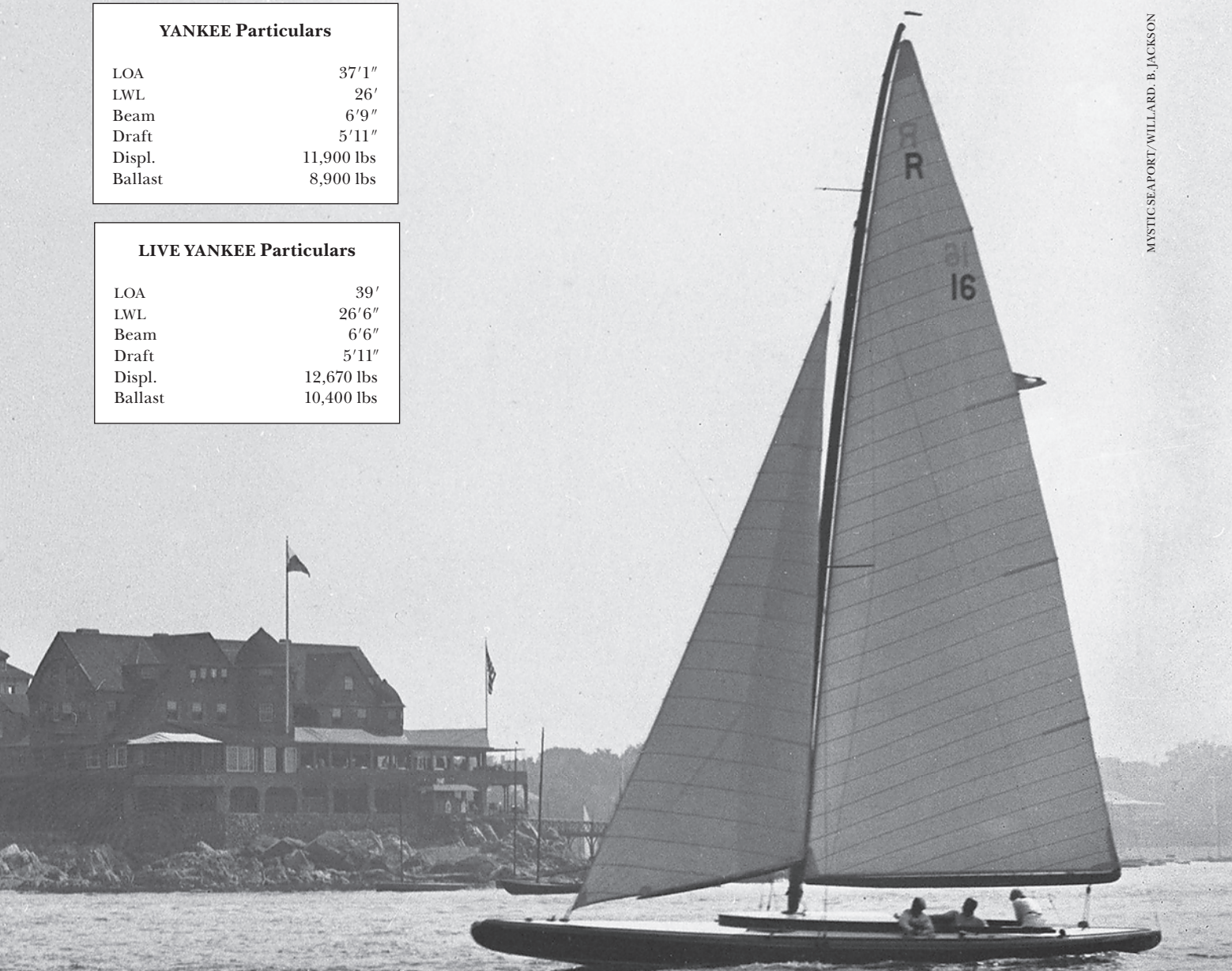
YANKEE Particulars

LOA	37'1"
LWL	26'
Beam	6'9"
Draft	5'11"
Displ.	11,900 lbs
Ballast	8,900 lbs

LIVE YANKEE Particulars

LOA	39'
LWL	26'6"
Beam	6'6"
Draft	5'11"
Displ.	12,670 lbs
Ballast	10,400 lbs

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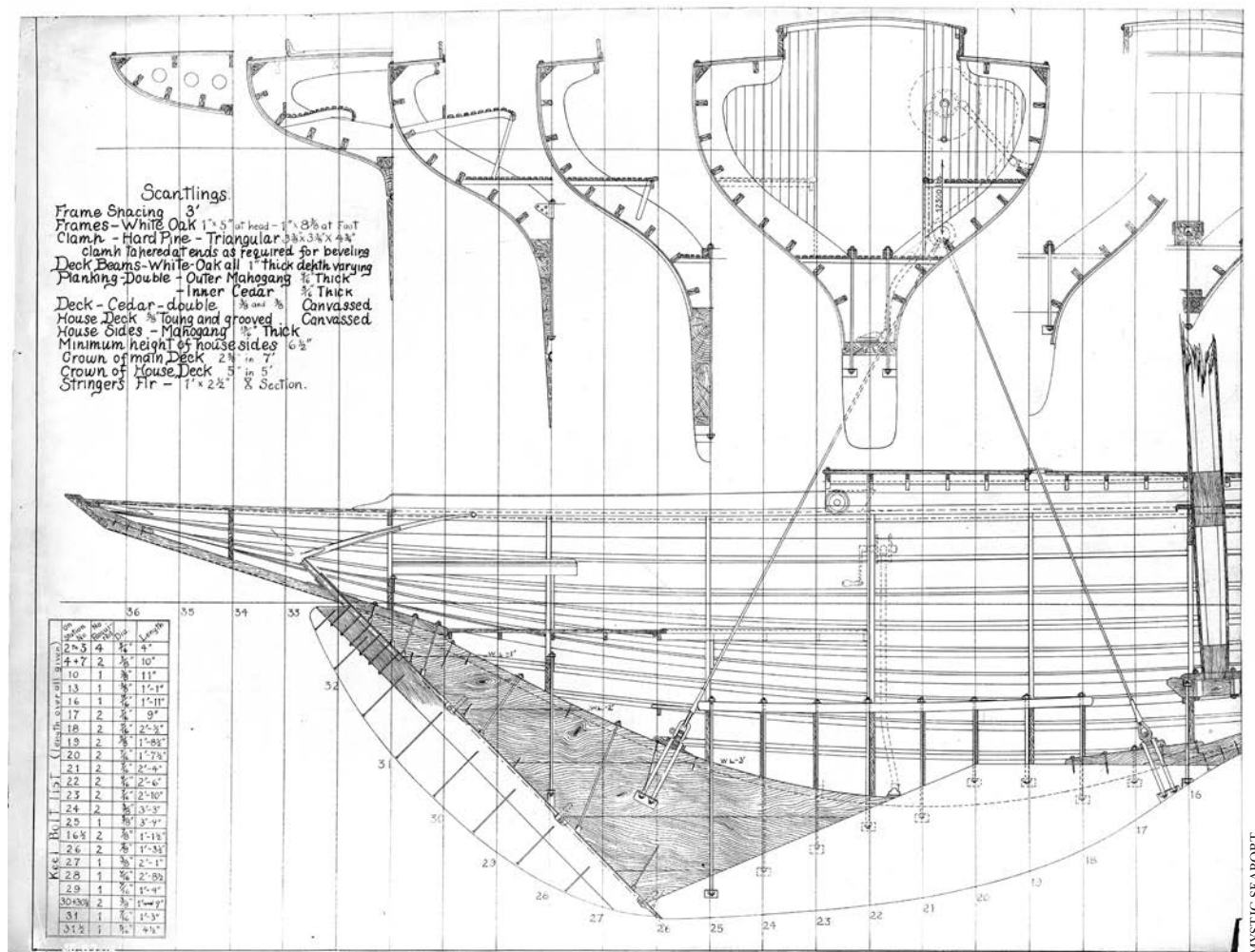


L Francis Herreshoff is widely remembered for the artistry he brought to yacht design, but he inherited an engineer's sensibility from his father, Nathanael G. Herreshoff, and later refined it while working with designer W. Starling Burgess. In 1924, while still employed by the design firm Burgess, Swasey, and Paine (BS&P), he had the opportunity to apply this skill to a new racing boat for Charles A. Welch.

Charlie wanted a boat to race in the R class of the Universal Rule. The designer and client were well

acquainted with each other by this time, for Francis had already designed for Charlie a ketch called STORMY PETREL—a boat they'd cruised in together on numerous occasions. They'd no doubt discussed the idea of this new R-boat on these trips, during which they'd heave-to on cold blustery fall evenings in Massachusetts Bay. Charlie wanted a distinctive racing boat, and was willing to take a risk with his friend Francis, who had not yet designed to a racing rule. And for Francis, the artist whose engineering was chiefly intuitive, there was

The start of a match race between YANKEE (left) and LIVE YANKEE in Marblehead Harbor, 1927. Charles Welch commissioned L. Francis Herreshoff to design this pair of distinctive R-boats, which were launched in 1925 and 1927, respectively. In 1928, at age 28, Welch became the youngest commodore in the history of the Corinthian Yacht Club, which appears here between the two boats.



YANKEE's revolutionary construction plan, with its long, light stringers running fore-and-aft and its widely spaced web frames, saved considerable weight without sacrificing strength. The so-called "longitudinal construction" was the major factor in giving YANKEE her advantageously high ballast-to-displacement ratio.

the constant need to take a chance in order to test his vision of a boat.

Francis would later describe his yacht designs as "scientific." By this he did not mean that he conducted experiments with models in towing tanks or wind tunnels, for he did not trust that the results of such tests would translate accurately to full-sized vessels. Nor did he mean that he used mathematical formulas to determine the characteristics of his designs. Rather, he used his artistic sense of proportion, together with his own design experience, to work out every detail of a yacht, including all of its structural members and all its spars, fittings, and hardware, to exact specifications that, in his opinion, would maximize strength, durability, and lightness. He emphasized lightness, as had his father, in order to increase the ballast-to-displacement ratio for best performance. He was justifiably proud of his "scientific" approach, for he did have extremely high aptitudes and abilities in both art and engineering, even though his engineering was not based on any university-taught curricula. Charlie Welch's new R-boat would be the vehicle that would demonstrate that L. Francis

Herreshoff was a top yacht designer.

Francis started to design the boat, to be named YANKEE (BS&P design No. 272), in late 1924, after a summer of much crewing in races in R-boats. His lines drawing was traced in ink by Norman Skene, the author of *The Elements of Yacht Design* and a colleague at BS&P, and dated October 22, 1924. There was nothing radical about the shape of her pretty hull, the only unusual feature being the shape of the bow. The bow lines lie low as they reach forward, to increase sailing waterline length; when they are too high to reach the water even with the boat heeled, they rise quickly in a snub nose. The practical reason for the bow shape was to gain an advantage under the rating formula; the aesthetic result was a distinct knuckle shape in the stem profile. Francis liked the looks of the knuckle, accentuating the ever-changing curve, and he reproduced it in a number of future designs that had nothing to do with the Universal Rule. Here is a unique case of a rating rule helping L. Francis Herreshoff's aesthetics, a case he never acknowledged during his diatribes on the ill effects of rating rules on yacht design.



This view of the YANKEE's cockpit shows what her web-frame construction looked like.

Eliminating the headstay removed a major interference with the spinnaker and allowed the development of today's ubiquitous double-luff, or parachute, spinnaker, once the rules were changed to allow such sails. Francis would be at once proud of his part in such an important change and scornful of the huge sails, which he thought emphasized the power of money and muscle over sailing skill.

Francis developed several ideas for YANKEE that would become common practice. He had pioneered the use of the tangs and a box-section mast when assisting on the design of Paine's GYPSY, and he used these on Charlie's YANKEE. The then-conventional spliced

YANKEE's sail plan showed an important evolutionary step in the design of the marconi sloop rig for racing: the enlargement of the foretriangle, particularly its height. On Frank Paine's R-boat GYPSY, of two years earlier, the height of the foretriangle was just under 28', and the length of its base 9'; comparable measurements for Francis's YANKEE were 36'10" and 10'. YANKEE's jib was more than half again as large as the jib of GYPSY. While GYPSY had 17 percent of her sail area in the jib, YANKEE had 26 percent. In an evolutionary trend that would continue, Francis had taken a giant step. How much Starling or Charlie may have been involved in the decision to give YANKEE her big foretriangle is not known, but there is no recorded argument against Francis's taking credit for it. However, Starling was at the time applying his knowledge of aerodynamics to the relatively new marconi rig; he was watching what his designers at BS&P were doing and was prone to engaging them in discussions of the work, so he must have been an important influence on Francis's enlargement of the foretriangle.

To support YANKEE's long forestay and keep it as straight as possible, Francis led the running backstays much farther aft than was normal practice, an innovation that would be much copied. Moreover, to help keep the forestay straight, he "left off the headstay [an outer stay leading to the masthead]," he would write later, "in order that all of the aft tending strains would come on the forestay, and this necessitated a spanstay to support the masthead." The spanstay, or jumper stay, as it would come to be called, helped keep the forestay tensioned by stiffening the upper portion of the mast. This novel staying arrangement was much copied, for it significantly reduced windage because there was no long, separate headstay leading from bow to masthead. Later, Francis would write ambivalently about a further advantage of jumper stays over masthead stays:

eyes around this rectangular mast would not have allowed the standing rigging to be set up taut enough to keep the long jibstay from sagging. The hollow, rectangular mast facilitated another innovation he made to further reduce wind resistance: running the hauling parts of the main and jib halyards down inside the mast, instead of outside. Again, Starling's influence may be felt: Francis would write, "In 1925 I was much interested in schemes for reducing the wind resistance of rigs when close-hauled. I was working for Starling Burgess at the time, and perhaps because he had been an aeroplane designer we were over wind-resistance conscious."

For the main boom, Francis designed a T-sectioned spar whose purpose was to provide an endplate at the foot of the mainsail to redirect any downdrafts from the sail aft and increase the driving power. Other designers would also copy this idea, but we should note that at about this time, Dr. Manfred Curry, in Germany, was also experimenting with T-booms and that Francis was reading the issues of *Die Yacht* that presented Curry's ideas.

If YANKEE's rig was evolutionary, her hull construction was revolutionary: She was the first wooden yacht with a framework of lengthwise stringers set into athwartship frames; the typical construction of the day relied mainly upon athwartship frames, with perhaps a longitudinal stringer or two. YANKEE's competitors had some 40 steam-bent frames per side, typically 1½" square in section. YANKEE had 11 web frames, 1" thick, but varying from 5" to 8¾" in depth, each designed "as a separate engineering problem," as Francis wrote in his book, *The Common Sense of Yacht Design*. Each web frame was continuous from the keel, up one side of the boat, across under the deck, and back down to the keel on the other side. Only the five web frames in way of the deckhouse and cockpit were interrupted by those structures.

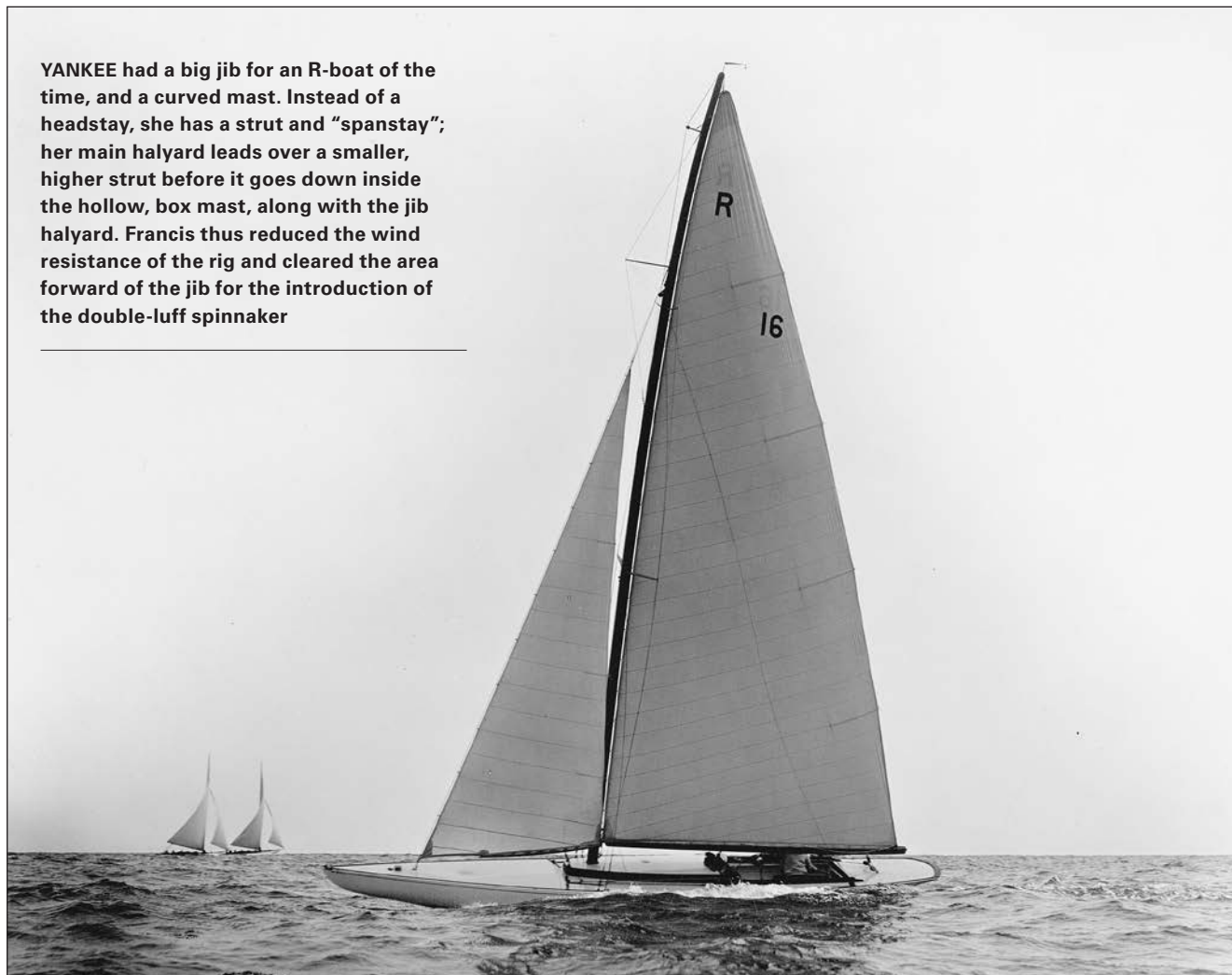
The smallest of the web frames, in the bow and stern, were almost solid. And instead of a single stringer on each side, she had nine, including one under the deck. The sectional shapes of the wooden stringers was like a capital I, 2½" high, with 1"-wide serifs. Francis's description of the construction was "longitudinal frames like stringers let into deep web frames widely spaced." In March 1926 he listed the advantages of this so-called "longitudinal construction" for the readers of *Yachting*: rigidity, longevity, economy, and lightness above the waterline. Ten months earlier, *Yachting* had editorialized against allowing longitudinal construction in racing yachts, and Norman Skene had defended the concept in a letter to the editor. Longitudinal construction was never outlawed under the Universal Rule.

In designing the first longitudinal construction for a wooden yacht, Francis had no experience of his own or of anyone else to rely upon. He may have been able to borrow some of Starling's experience with aircraft construction; nevertheless, YANKEE's construction drawing, showing the shapes and dimensions of an entirely new type of construction, is a stunning indication that Francis had a superb sense of proportion. In later designs, he made only minor refinements to his first try at this revolutionary method.

Being well satisfied with the way the Britt Brothers had built the schooner JOANN (see WB No. 244), Francis and BS&P chose them for the exacting task of building YANKEE. She would be their first racing boat. Francis's later evaluation of the Britts would be that they built yachts to about the same quality as the Herreshoff and Lawley yards, but at 25 percent less cost.

On May 6, 1925, Francis sent a set of YANKEE's blueprints to his father, who had earlier thought him unworthy of the study of yacht design. There could be no greater evidence that Francis was finding his way with a growing sureness and confidence than the fact that he, the fledgling yacht designer, had the courage to send his work to the man he thought was the world's greatest yacht designer, the father who had years earlier banished him to agricultural college. Francis was proud of his work and doubtless wanted to show his father what he could do, but he must also have been anxious about Nathanael's reaction. Nathanael was favorably impressed, but his praise was lukewarm. He congratulated his son on his draftsmanship and for the design itself. He promised to keep the blueprints "strictly private." The father and son had been estranged for four years, and in this correspondence they carefully reconnected, tiptoeing around the possibilities of openly

YANKEE had a big jib for an R-boat of the time, and a curved mast. Instead of a headstay, she has a strut and "spanstay"; her main halyard leads over a smaller, higher strut before it goes down inside the hollow, box mast, along with the jib halyard. Francis thus reduced the wind resistance of the rig and cleared the area forward of the jib for the introduction of the double-luff spinnaker



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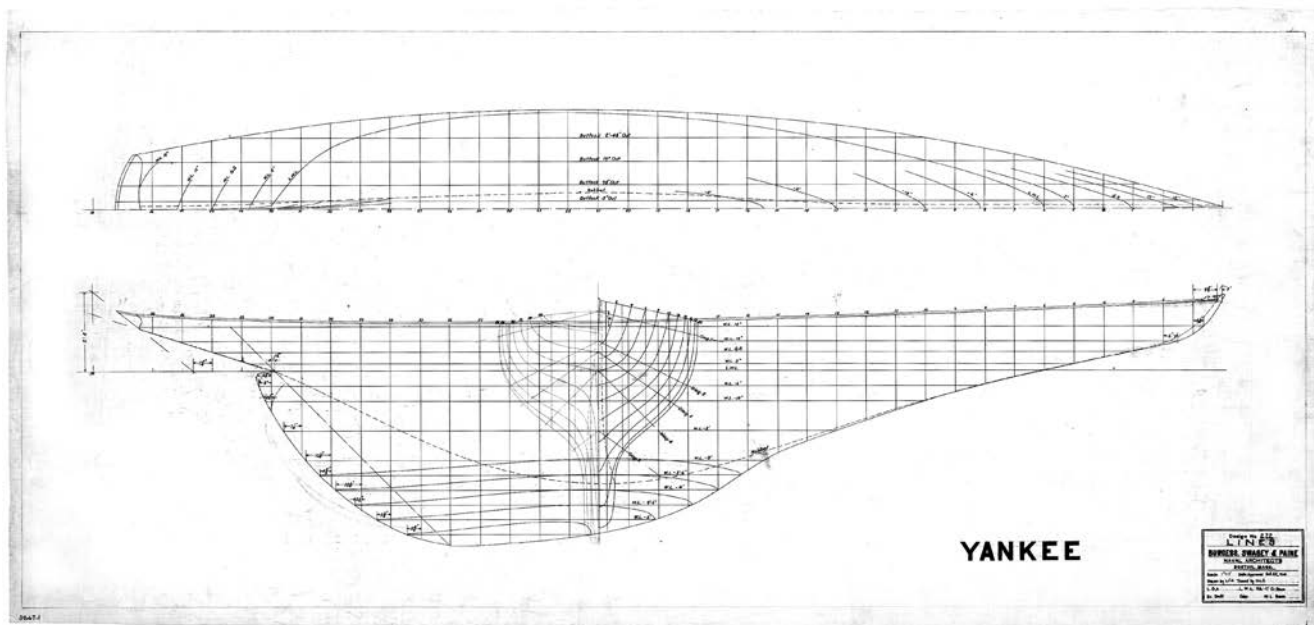
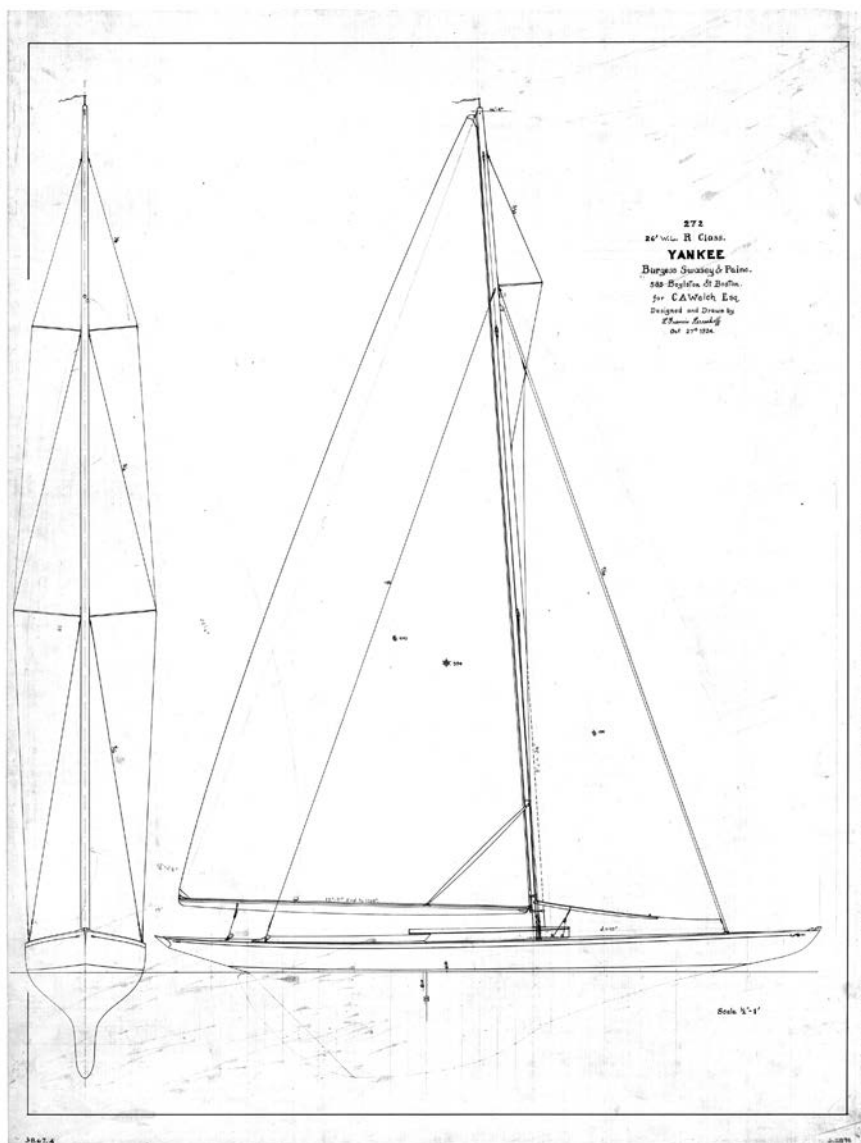
discussing the great subject that fascinated them both.

In her first season, YANKEE won two major East Coast racing cups, as well as Marblehead Race Week. She won the Manhasset Bay Yacht Club Challenge Cup and the Greenwich Cup at the Indian Harbor Yacht Club, both sailed on Long Island Sound. YANKEE was proving to be a fast boat, and Charlie, at age 25 the youngest of the R-boat skippers, was proving himself to be an excellent racing sailor. He had a fine crew including, for at least some of these races, the boat's designer.

In her second season, 1926, YANKEE was the top R-boat of the Eastern Yacht Club. In September, she added another major trophy to her collection: the New York Yacht Club Cup for Class R. Nine boats competed for that cup off Newport, Rhode Island. The races were sailed in breezes

Right—YANKEE's sail plan shows her high foretriangle, backstays led well aft, and main-boom strut. Her sail area is 633 sq ft, with 479 sq ft in the mainsail (including roach) and 154 in the jib.

Below—YANKEE's lines drawing shows Francis's first knuckle bow, a profile shape induced by the Universal Rule and one that would become a recognizable feature of some of his future designs of both racing and non-racing boats.





L. Francis Herreshoff, seen here in his double-paddle canoe, was an artist and intuitive engineer.

of competition. YANKEE, in short, proved that L. Francis Herreshoff was his father's son. For Francis's psyche, nothing could have been more important.

Charlie wanted Francis to design another R-boat for the 1927 season. By this time, Starling had folded BS&P, had divorced his second wife and married his third, and had opened a new design office in New York. Francis was left on his own, and it was the best thing that could have happened to him. He settled in Marblehead, Massachusetts, and lived there for the rest of his life, going on to design yachts with ever-increasing confidence. Charlie named his new R-boat LIVE YANKEE. She would be Francis's design No. 21.

Francis and Charlie were an unusual combination. Most designers and owners of such a successful and innovative racing boat as YANKEE would have designed and sought successor craft that duplicated her, with minor improvements. That would be the safe, logical course. (It was the course Nathanael steered when he followed his innovative, successful GLORIANA with her near sistership, WASP.) But Francis and Charlie were stimulated by YANKEE's success, rather than satisfied with it. Charlie had great respect for Francis and gave him free rein with LIVE YANKEE.

By 1927, most sailboat racing was in one-design classes. The year before, Charles D. Mower had designed the Long Island Sound Interclub class and the Alden office had produced the Triangle class, both of which proved popular. In these classes the boats were identical, so winning races depended on the skills of skipper and crew; the designer of the boats had no influence on which boat won. But under the Universal Rule, the boats, though related in form and general size by the measurement formulas, were not alike; the Universal Rule gave designers a chance to show their stuff. Designing LIVE YANKEE was a dream come true for Francis. With Charlie's new R-boat, Francis could try any of his ideas for making a sailboat go faster, albeit at the financial risk of his friend and patron. With LIVE YANKEE, Francis pulled out all the stops. To get his schemes on paper took 32 sheets of plans.

Francis had been experimenting with a radical new rig to reduce wind resistance when sailing close-hauled. He had wanted Charlie to try it on YANKEE, but Charlie thought it too expensive. But for LIVE YANKEE, no expense was to be spared.

Francis's idea was to streamline the mast and beef it up so much that very little standing rigging would be needed, and to set the jib on a luff spar instead of a stay. He stepped the mast on deck in a bearing, so it could rotate in order to achieve the optimum angle of attack of the mainsail's leading edge. The jib spar could also rotate.

In addition, he smoothed out the airflow between spars and sails. In section, the mast and jib spar were

from light to fresh, with a big groundswell. William U. Swan reported in *The New York Times* that "the YANKEE breezed up to windward faster than any boat in the fleet. Indeed, her speed was so great relatively that her skipper did not have to worry about covering this or that yacht but sailed his own course and usually reached the weather mark with the race well in hand." After four races, YANKEE, sailed by Charlie with Francis in the crew, had the most points. The race committee eliminated the last five boats (including GRAYLING, designed by Nathanael Herreshoff), and the four leading boats went on to sail two more races. YANKEE won the cup; Nathanael's GAME COCK came in last.

Francis was showing his father that he had been wrong to believe him incapable of designing yachts; Nathanael may have admitted that error in judgment to himself, but he didn't admit it to Francis. However, he did write to Francis: "I congratulate you on the victory of YANKEE in the races at Newport this week. And in fact, all your work in the last year or two stands for a good deal of credit."

Charlie sold YANKEE after the 1926 season to make way for a new R-boat. YANKEE went on to race successfully on Long Island Sound for the next ten years and on Lake Michigan for nine more years. *Lloyd's Register of American Yachts* listed her through 1974, her longitudinal construction serving her well. Francis sold a set of her plans for \$45 in 1969, nearly 45 years after he had drawn them; they went not to a boatbuilder, but to an art collector.

Any yacht designer could be proud of the R-boat YANKEE. It is remarkable, however, that she came a mere five years after Francis's first design, a 15' LWL daysailer for Narragansett Bay. He was nearly 35 years old, and had spent a decade farming and serving in the Navy during the Great War. YANKEE gave him the intense pleasure of seeing a complicated racing yacht he had designed, with evolutionary and revolutionary concepts, take shape at the hands of its builders. He sailed in that boat and sensed her speed and motion. He participated in some of her wins at the highest levels

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LIVE YANKEE, seen here working to windward in a gentle breeze off Marblehead, was Francis's no-holds-barred successor to YANKEE. The boat's deep cockpit allows the crew to be down out of the wind.

to be of conventional width, but of about twice the normal dimension fore-and-aft, for strength. Whereas YANKEE's mast was supported by 10 pieces of wire standing rigging, including running backstays—all of this, in turn, supported by two pairs of spreaders and two struts—the new rig would be supported by just two shrouds and one pair of spreaders. The forward sides of the hollow mast and jib spar were rounded off, but their after sides were left nearly square. The sails did not have a simple luff hoisting on a single, central track; rather, each sail had two luffs that hoisted together on a single halyard, each luff on a rope in its own groove, let into the after corners of the squared-off spar. The two luffs extended aft for about a quarter of the width of the sails and then joined to form a single layer of sail the rest of the way to the leech. By joining spar and sail in this way, Francis created an almost entirely smooth airfoil. He applied for a patent on the new rig on December 11, 1925; Patent No. 1,613,890, for 17 years, was granted him exactly 13 months later. Francis also increased further the size of LIVE YANKEE's foretriangle.

Francis drew a double-ended hull for LIVE YANKEE. This form takes advantage of the Universal Rule by reducing the quarter-beam on-deck length at the stern without reducing waterline length proportionately, his theory being that rating is reduced with no adverse effect on speed. He streamlined the deck edges, especially at the bow and stern, thus giving the boat the feature that did most to make her look modernistic, or, as *The Rudder* put it when the editors got around to recognizing the design after she'd raced for a summer, "startling." *Yachting* was less kind, describing LIVE YANKEE as a "sensational, not to say freakish, so-called R-boat." The "startling," "freakish" LIVE YANKEE branded Francis, in some circles, as a crackpot. Although Francis was willing to risk much in order to try out his ideas, he was sensitive to criticism. He could be hurt and driven inward, but his confidence in his design concepts didn't waver.

Francis used a different underwater shape from that of YANKEE. LIVE YANKEE is a little longer and narrower than YANKEE, but the chief difference between the boats may be seen by comparing their midsections. The new boat is less cut away, with slack bilges extending down in a nearly straight line to a thick keel. This deep, almost triangular, sectional shape increases speed-reducing displacement, but decreases the speed-reducing area of wetted surface, in hope of an advantageous tradeoff. With LIVE YANKEE, Francis went far down the road of reducing wetted surface, much farther than he



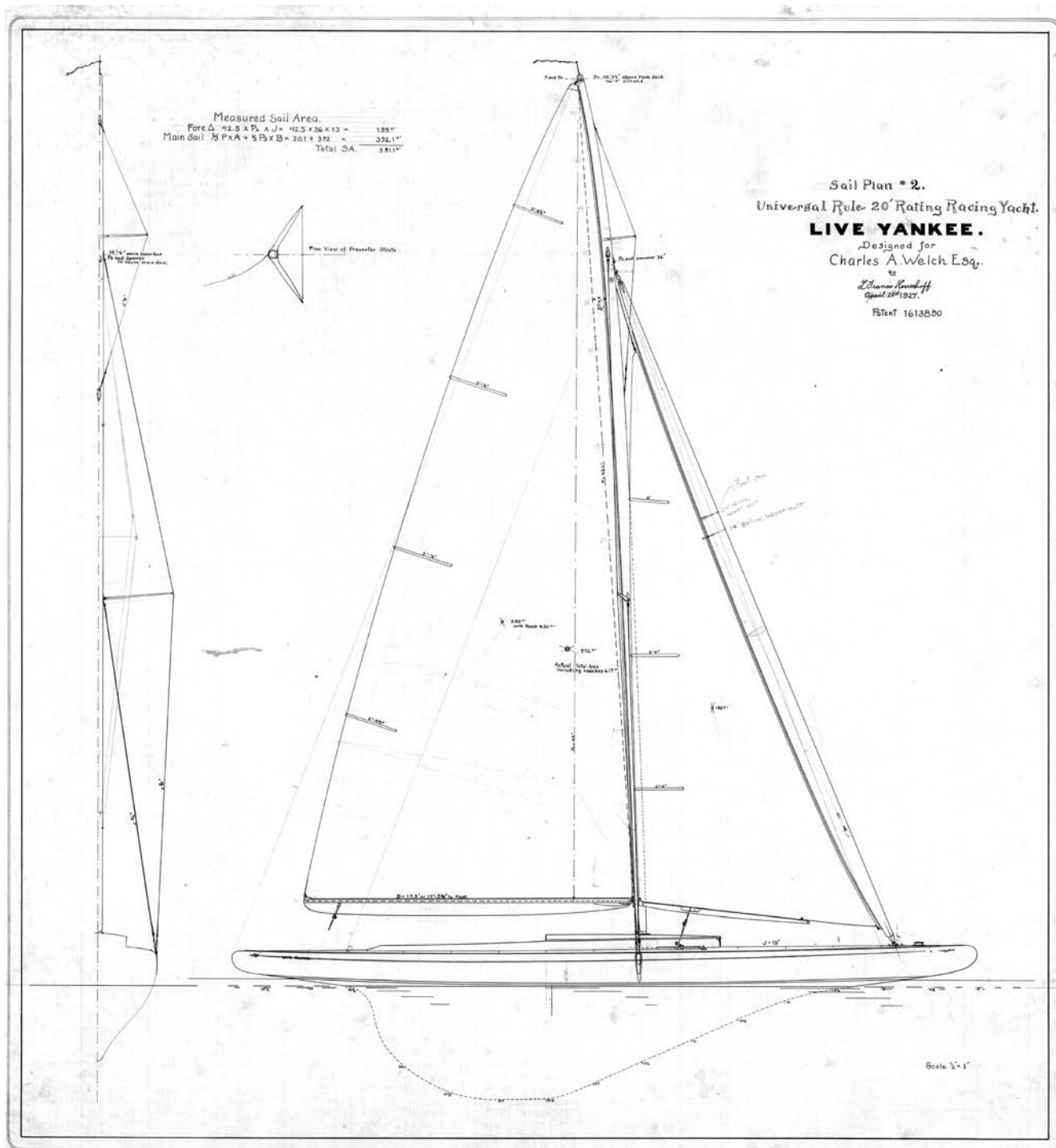
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had with YANKEE, and farther than he would with any future boat he designed to the Universal Rule.

Francis drew LIVE YANKEE's bold new hull shape in January 1927, and Norman Skene traced his penciled lines in ink and calculated the boat's displacement based on Francis's lines. Displacement is a key factor in the Universal rating formula, and so it must be determined in advance, along with the Rule's way of measuring length and sail area, in order to produce a boat with the designer's concept of the optimum relationship between the three factors that will not exceed the maximum allowed rating. Thus, in drawing the lines for an R-boat, Francis had to "hit" his desired displacement, as well as his desired length measurements. Many a designer took the guesswork out of the procedure by drawing a curve representing the exact desired displacement and how it would be distributed from bow to stern. Then he would draw cross-sections, showing the shape of the hull, with areas corresponding to his displacement curve, perhaps adjusting the shapes of the sections in revised drawings, but knowing that as long as he drew sections that conformed to his displacement curve, he would create a boat with the exact displacement he wanted. Francis preferred to draw his lines without the guidance—and restrictions—of a displacement curve, trusting that his sense of proportion and his growing experience would enable him to draw a shape based on his artistic sense of what was right and that the resulting hull would come very close to his desired displacement.

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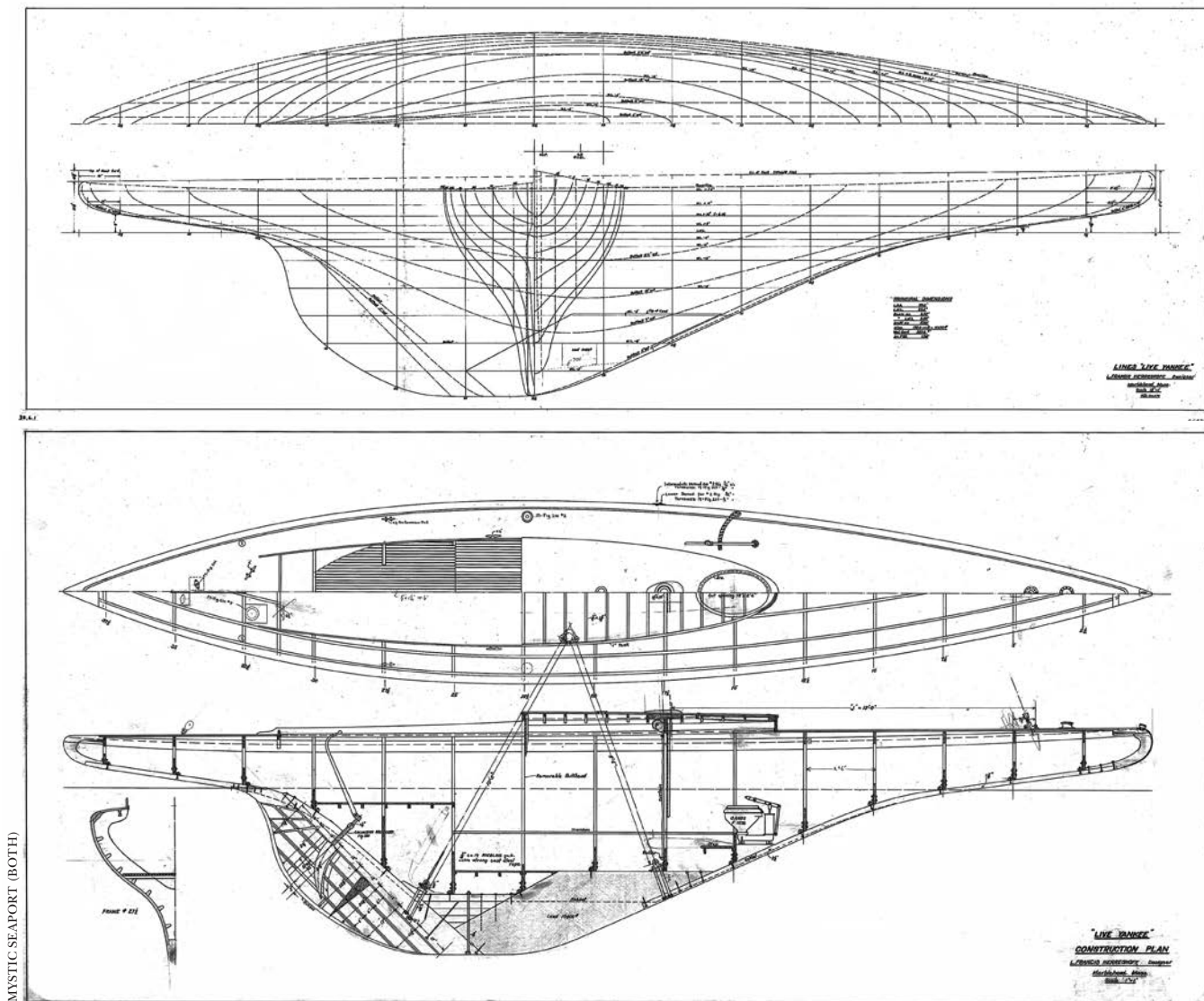


When LIVE YANKEE's first rig was outlawed, Francis drew this sail plan dated April 22. Gone are the original's streamlined double-luffs, but there was no objection to the jib-luff spar, so Francis kept it in order to eliminate running backstays. To support the curved masthead, he designed two struts instead of one, placed at an angle so that their stays would pull sideways as well as forward. This V-shaped arrangement of jumper stays, as they would come to be called, became standard practice.

In the case of LIVE YANKEE, when Skene figured the boat's displacement (by measuring the areas of the underwater sections Francis had drawn, multiplying by the distance between them to get the underwater volume of the boat in cubic feet, and then multiplying by the weight of a cubic foot of salt water, 64 lbs) he got

12,670 lbs. And that was exactly the maximum displacement allowed by a provision of the Universal Rule that limited displacement in proportion to waterline length! Francis had hit it, all right.

The next step was to decide how much of LIVE YANKEE's displacement could be ballast. The more stability



Top—Francis kept LIVE YANKEE's wetted surface, with its attendant resistance, low with a deep, V-shaped hull, rather than the wineglass-shape he'd drawn for YANKEE. **Above**—LIVE YANKEE's construction plan is similar to YANKEE's. This drawing shows the support for the mast, provision of hoisting eyes, and the very deep forward end of the cockpit. It also shows Francis's innovative fishtail rudder, made up of tapered, rubber strips connected by piano hinges. It was controlled by a vertical tiller. The idea was to reduce the rudder's drag, but nobody, including its designer, copied this innovation.

for a given displacement, the more potential speed; so the more percentage of displacement in ballast, the better. Skene figured the weight of the materials he had dimensioned according to Francis's longitudinal construction scheme at just over a ton, so all the rest of the 12,670 lbs of total displacement could be ballast. Francis approved giving the new racer the advantage of 10,400 lbs of outside lead on her keel, a ballast-to-displacement ratio of a whopping 82 percent. The moment of truth for all these drawings and calculations comes when the boat is launched. Thus, launchings produce not only the excitement of the birth of a new, promising racing yacht, but also the tension—especially for the designer—surrounding the discovery of just how the newborn will float.

LIVE YANKEE floated low. Francis didn't quite hit it this time. He had been optimistic about the ballast,

and 750 lbs of the lead had to be removed, reducing the ballast-displacement ratio to 76.2 percent—still the highest of any R-boat.

A couple of months before LIVE YANKEE was to be launched, officials of the New York Yacht Club, having been shown her plans by Charlie, outlawed Francis's double-luff sails and rotating mast. Francis had to design a new rig in a hurry. There was no objection to the jib-luff spar, so he kept it. He couldn't keep the rotating mast, but he left the new mast stepped on deck, because there wasn't time to design and build a new maststep down inside the boat. Thus, LIVE YANKEE became the first racing sailboat with a deck-stepped mast, though the next year, and for the rest of her life, she had a conventional maststep below deck.

The jib-luff spar turned out to be a problem; it slatted violently when the boat was moored in a strong breeze.

In LIVE YANKEE, Francis increased the number of web frames from 11 to 14, thus decreasing their spacing. He kept the same number of fore-and-aft stringers, changing their sectional shape from the capital I to a simple oval, 2¼" high and 1½" wide at the base. Planking was double, with an inner layer of 5/16" pine and an outer layer of 11/16" mahogany; the garboards were fastened directly to the lead.

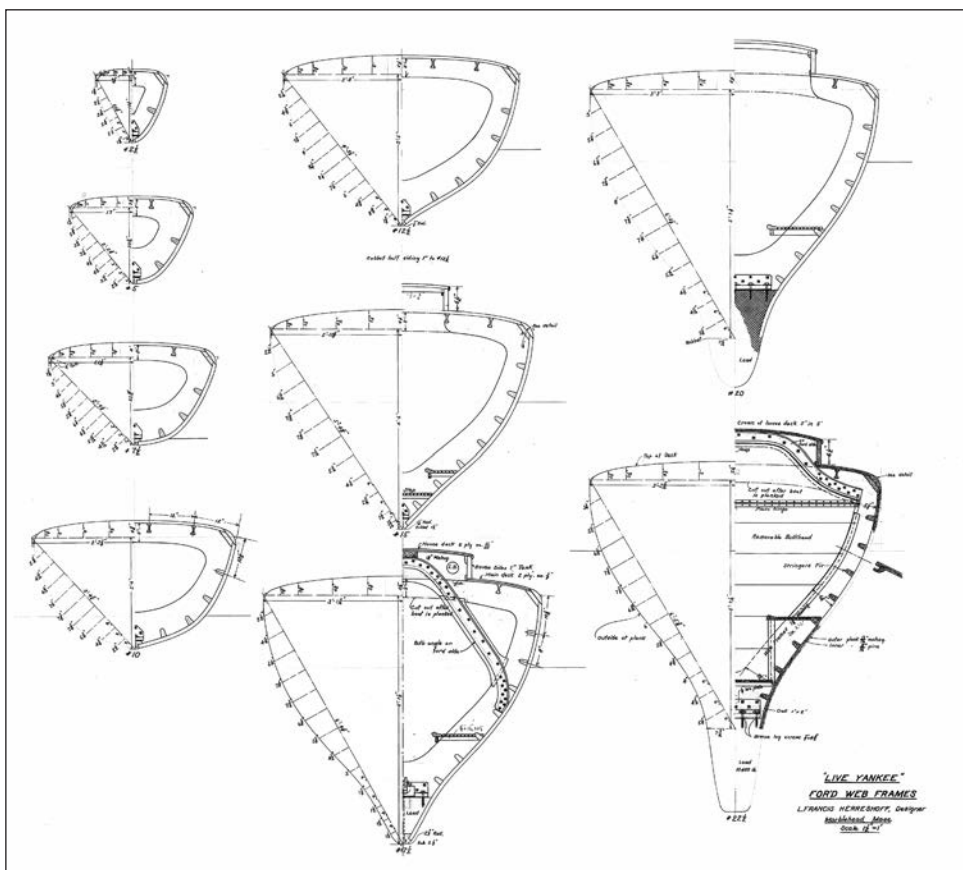
Moreover, in the early racing of the boat, Charlie felt that the spar's windage was detrimental. So Francis drew a third sail plan, with a conventional forestay, held straight by running backstays led well aft, as on YANKEE. He added a permanent backstay from masthead to stern and another pair of shrouds. Making these between-races changes to LIVE YANKEE's rig became a race against time, and Francis helped by turning out a few fittings, such as turnbuckles, on his Hjorth lathe.

When the jib-luff spar was replaced by a forestay, backstays, and additional shrouds, Francis had also intended that the mast be beefed up, but LIVE YANKEE raced again before that could be accomplished, with the result that 10 minutes before the start of the Fourth of July race, in a fresh northwester, the mast "crumpled into what seemed 50 pieces." This description of the dismasting was telling, in terms of Francis's engineering by eye, instead of by mathematics. His sense of proportion for the related sizes of the different parts of a rig was so good that when there was a failure, there was general disintegration, rather than the more typical single break.

In her early races, the startling-looking LIVE YANKEE didn't startle anyone with her speed. In her first three races in the R class, she was seventh out of eight, seventh of nine, and eighth of nine. True, she was racing with a new rig that Charlie hadn't had time to test and tune, but she was also a different sort of boat to sail: She had a flexible rudder that was warped to steer the boat (rather than a typical hinged board), and she had a vertical tiller. These things required some learning on the part of the skipper and crew.

LIVE YANKEE began to win races as the 1927 season progressed, and Charlie got used to sailing her. In August she won her class in Marblehead Race Week, and in September she won the New York Yacht Club Cup for R-boats off Newport, coming in first in each of the three races in light, fresh, and strong breezes.

Charlie continued to race LIVE YANKEE through



two more summer seasons. In 1928, she won her class at Marblehead Race Week and was the national R-boat champion. On August 14, 1929, she won the Manhasset Bay Cup, beating a new Frank Paine-designed GYPSY by one point. And Ruth Welch, Charlie's wife, won three more Lady's Plate trophies in LIVE YANKEE to go with two she had won with YANKEE.

After the 1929 season, Charlie sold LIVE YANKEE to Jessie P. Morton, who won the season R-boat championship in Marblehead in 1930. A half dozen later owners continued to race her successfully on both coasts and the Great Lakes. She disappears from *Lloyd's Register* in 1966.

LIVE YANKEE met Charlie's and Francis's criteria for an R-boat that was different and innovative. That she won races for so long with such a variety of hands on her tiller shows that her distinctive features gave her an advantage. Like her predecessor, LIVE YANKEE was a landmark design. It is puzzling that neither Francis nor any other designer copied her. Perhaps her reputation as a weird-looking "lead mine" was simply too powerful. In 1946, Francis sold a set of her lines and sail plan to an admirer of the design for \$6.

Roger Taylor lives on board a Dutch steel powerboat, WATER LILY, with his wife, Kathleen Carney. When not acting as captain and commissary officer on board the Lake Champlain Maritime Museum's replica canal schooner LOIS McCLURE, they have patrolled the rivers and canals of Holland, Belgium, and France in WATER LILY. But now they have "retired" and threaten to add a boat for the Intracoastal Waterway.



MARITIME MUSEUMS



If you want to learn more about wooden boats, particularly about their origins and history, visit a maritime museum. Each of the museums listed here has something to offer the wooden boat aficionado — from half models and historical photographs to full-sized watercraft. Boatbuilding skills are sometimes taught under the auspices of maritime museums and there are often gatherings where people can rendezvous with their boats. Plan a summer visit to a maritime museum — call today for more information!



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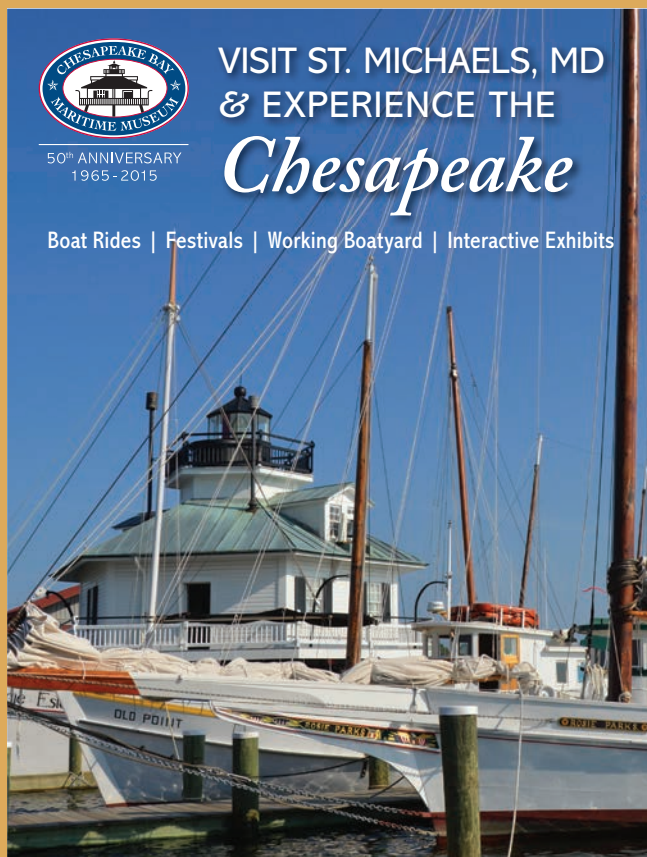


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Fairliner Torpedo Redux

**Runabout restoration
on the layaway plan**

by Lawrence W. Cheek

Photographs by Greg Gilbert

John Lisicich bounds into Bruce Bronson's boatshop—literally *bounds*, like a kid running into a bike shop on his birthday—and hails his friend with unrestrained joy. “Happy Wednesday! Happy Happy Wednesday! How ya doin’?”

There's 17 years of wooden boat history behind their relationship, and looking just at the raw facts, you might not expect it to lead to such an ecstatic greeting. Lisicich made monthly payments to Bronson for close to 10 years for a boat that didn't exist, except in the form of a dismal skeleton stashed on a dark overhead landing in Bronson's shop. Lisicich's wife, Sharon, made him a shirt with a photo of a glorious mahogany runabout on the front with the caption MY DREAM. The back depicted the decrepit skeleton and the admission MY REALITY.

“John wore out two of those shirts,” says Curt Erickson,

another friend with a key connection to this story.

But the dream finally has materialized, the reality is in the water, and it's performing spectacularly. This is a story of boat lust gone wild, off the rails of reason, consuming prodigious stacks of cash and a large hunk of a human lifespan, and yet in the end, everyone's thrilled. Not all wooden boat adventures end this way, of course, but when one does and it's infused with such unblemished happiness, it makes you think: worth every risk, any price.

The centerpiece of the story is the Fairliner Torpedo, an improbable concoction of curves produced by the Western Boat Building Co. of Tacoma, Washington, between 1947 and 1951. Erickson, who has owned five of them, says just 32 were built. It's a tightly composed boat, just 17' overall, with

Above—Eighteen years ago, owner John Lisicich discovered the skeleton of a rare runabout—A Fairliner Torpedo—in the Gig Harbor, Washington, shop of boatbuilder Bruce Bronson. He purchased what was left of the boat, and over the next decade made monthly payments on an eventual restoration.



Western Boat Building Co., known primarily for rugged seagoing vessels (see sidebar, page 45), produced the Fairliner Torpedo between 1947 and 1951.

a 6' beam. The original base price was \$3,150, which was \$250 more than a new Cadillac convertible commanded in 1947. Western's ads claimed a 38-mph top speed with the 104-hp, six-cylinder Graymarine. Bronson thinks that speed claim might have been slightly hyped, but there's no question that the Fairliner was built to be fast. It was extremely light—the *frames* were of Sitka spruce, which in the long run turned out to be not so hot an idea. Even in its meager production run, Western kept experimenting with tricks to squeeze out more speed, such as the very small rudder on the boat that now belongs to Lisicich. This was another questionable design innovation, because when approaching a dock at low speed, Lisicich's Fairliner steers...well, hardly at all.

Lisicich is a guy who snags on a chance encounter with an object or idea, which then erupts into an unrelenting passion. He once heard a rumor about a

combination player piano and violin called a Violano Virtuoso that was in a home basement near Tacoma and might be for sale. He knocked on doors for more than two years trying to find it. He had the friend who related the rumor to him hypnotized twice, trying to improve the friend's recollection of where this home might be. Finally he and Sharon made three "wanted" signs and strategically planted them at the freeway entrances near the neighborhood of the machine's rumored existence. That worked: The owner called and he bought it.

"The way to get John's attention," says Sharon, "is to say that something is unavailable at any price, and impossible to find."

"I've never wanted to have the things that other people have," Lisicich says. "I've always wanted the things that were unique and different. I think it's because I've always been a sales guy. I think I was born being a sales guy. The jobs I've had, the companies I was with, it's always been a unique product. Anything you're passionate about, if you can share that passion with somebody, then you can create that excitement about it: a boat, a car, a piano, a brand."

He readily admits he's an obsessive. Ask if there's a downside to it, and he pauses maybe a second. "No, I don't think so," he says. Then, brightening, "Because it's only about good stuff!"

One day in 1997 he was talking boats with his cousin

Lisicich admits to being "obsessive"—a trait apparent in both how he acquired his boat and how he cares for it.





NO KA 'OI is powered by a four-cylinder, 140-hp MerCruiser—a lighter and more powerful engine than the original six-cylinder Graymarine.

and mentioned that he was thinking about buying a classic wooden Chris-Craft. The cousin, who had already keyed in on Lisicich's fixation with rarity, said, "Oh, John, you've got to have a Fairliner Torpedo." The cousin actually owned a set of plans for the boat, and gave it to him to copy. The next year Lisicich went to visit Bronson, who had a reputation as the man in the Tacoma area to see about building classic wooden speedboats. "I could do it," Bronson said, "but why don't you just buy mine instead?"

Bronson pointed up to the landing. There wasn't much of a boat up there, just a falling-apart cage of frames, battens, and bulkheads with a few stray parts collected in an old Pennzoil box. But Bronson explained the process of building an essentially new boat by using the remnants of this old one for patterns. Erickson had brought him two of these Fairliner Torpedo hulks; he'd rebuilt one for Erickson and kept this other one himself. It sounded good enough to Lisicich.

"I won't be able to get to it for a long time," Bronson warned.

"That's all right," Lisicich replied. "I won't be able to pay you for a long time, so I think we've got something in common."

They worked out something resembling a layaway plan. "We paid him 300, 400 bucks a month for years and years," Lisicich says. "Finally around 2007 or '08 he said we'd paid him up, and he would have it for us next year. Well, it took him a little longer—like five years. But it got done." Bronson recalls the last interval a little differently—only two-and-a-half years.

It might be worth pausing here to note that Sharon Lisicich used to teach business math in college. John acknowledges that he is exceedingly fortunate to have married her—not only because she managed the family disbursements well enough to keep them out of trouble, but also because she has long tolerated his acquisitive quests, including this Fairliner foray. This is uncommon; the terms "business math" and "wooden boat" may never have slept together in any other household.

Bronson is a busy man, at least in part because of his own distracting passions. His shop is a motley conglomeration of several units in a nondescript warehouse storage complex in Gig Harbor, a bedroom town just across a narrow strait from Tacoma. His father was a boatbuilder, owner of the long-defunct Hollywood Boat Company in Tacoma. Bronson built hot rods for



The rebuilt boat is planked in meranti, which is less dense than the original's Honduras mahogany skin. Bronson's high standards are evidenced in the hand-painted "Fairliner" on the tachometer (below)—a job he subcontracted to a friend.



a living for some time before returning to his marine roots, but he didn't quite purge wheels from his system. One wing of his shop is occupied by a '37 Cord that he's restoring with a modern powertrain. This is not for a customer, but for himself. The rest of the space is jammed with wooden powerboats in assorted stages of renovation—some are his, some belong to customers. He works alone, so big projects don't get done rapidly. But they do get done with care.

"Bruce is an artist," Lisicich says. "He doesn't just go through the motions; he puts himself into these boats. Everything that comes out of his shop is perfect by the time it leaves."

Bronson seems perfectly matched to this particular niche of the wooden boat trade. "I grew up around boats like these," he says. "I've always loved them. This was a period when 'Made in America' really meant something. That it was the best, whether cars or boats. They're still timeless, 50, 60, 70 years on."

Ask Bronson what the problems are in rebuilding a Fairliner Torpedo, and he answers with a joke: "Pretty much everything." But he's not laughing. It's not a joke.

Spruce is terrific for spars and piano soundboards, but not for frames, which need a lot more strength, fastening-holding ability, and rot resistance than this wood offers. Anyone restoring a Fairliner Torpedo can expect to replace all of the frames with denser and more durable wood; Bronson used sawn meranti. The exquisitely pointy stern requires a laminated aft stem with chiseled pockets for the battens to nest in, and each pocket is cut at a different angle. Toward the stern, both battens and planks twist and bend in a demon's fandango of compound curves. Rumor was that at the original Western boatyard they broke half the planks they tried to hang, though that's likely another exaggeration. Still, Bronson cracked several. "It's probably the toughest boat I've ever planked up," he says. "There's lots going on there."

Bronson's approach to classic-boat renovation tracks with his classic car philosophy. He wants the boat or car to look very much like the original on the outside, differing only in details a connoisseur might spot. But he's not even close to a purist on any internal matters that affect performance, reliability, or comfort. His reasoning is simple: If the original builder had had access to superior technology, he would have used it. So Lisicich's Fairliner, for example, got a four-cylinder MerCruiser engine, which is lighter and more powerful than the original; it also has freshwater cooling, rather than the original's raw-water cooling. As he does with most of his runabout rebuilds, Bronson added a cockpit heater.

Bronson's finish and detailing are at the level this Torpedo's original intent deserves. The planking is meranti, less dense and somewhat easier to bend than the Honduras mahogany used for some of the original boats, but similar in color and grain. Bronson has fabricated a horizontal bandsaw so he can slide a 5/4 board through it to yield two near-identical 5/8" planks, and this allowed him to book-match the Torpedo's planking, each side mirroring the other in grain pattern. The instruments are from a defunct Tolleycraft,

The boat, as found, served essentially as a source of patterns. The original frames were of Sitka spruce—which is light and strong, but not terribly rot-resistant. The newly rebuilt boat is framed in meranti; engine beds are of Douglas-fir.



COURTESY OF JOHN LISICICH

but Bronson took the tachometer to a friend who is a master pinstriper and letterer, who hand-painted a tiny “Fairliner” in the dial to echo the original company logo. Lisicich thought the original plastic steering wheel looked a little cheesy, so he requested a banjo wheel. Bronson found one.

Bronson completed the boat in 2013, or so he thought. He and the Lisiciches took it out for a first run, and it performed beautifully. Lisicich kept thinking he was maybe sniffing more hot oil than seemed appropriate, but there was no outward evidence of trouble. He and Sharon took three more day cruises that summer, and the oily aura persisted, but everything still seemed okay. They put the boat away for the winter. Then on their first outing in summer 2014, they were enjoying a good fast run, the ominous aroma creeping around again, and suddenly the oil pressure gauge plummeted to zero. They limped back to the dock at idle, and then on a trailer to Bronson’s shop. Oil, slung everywhere, slashed the engine space. The filler, valve cover gasket, and rear seal all were blown out. Burrowing into

the engine, Bronson also discovered that the crankshaft was defective. He had used a rebuilt engine, but apparently it hadn’t been done well. Out it went for a re-rebuild.

The boat, named NO KA ’OI (Hawaiian for “None Better”) was finally launched again last spring. Lisicich is never at a loss for words, but relating his Fairliner’s life story has about drained his stock of superlatives by the time he gets to this second rebirth, and he is almost subdued when he’s asked to describe his feelings about owning it now. “Such a cool boat,” he says, quietly.

The Fairliner Torpedo seems as close to pure sculpture as any functional wooden boat can come. Yes, fiberglass boats can assume far more

Western Boat Building Co.

In 1968, the Fairliner Division of Western Boat Building Co. didn’t look like it was heading for oblivion. That year, *Boating* magazine’s directory of boating manufacturers listed Western’s array of 13 different motor cruisers and sportfishing boats from 26’ to 37’. But none of them were traditionally built; instead, all were being built with plywood hulls in an effort to compete for market share. In trolling today through that year’s directory, the trend is obvious: Fiberglass was in the ascendance. In the 1970 directory, Fairliner was absent. The name was sold to American Marine Industries in 1973, which from that point on built Fairliners in fiberglass.

Western, however, had enjoyed a distinguished run. It got its start in 1917 in Tacoma as a builder of commercial fishing boats, and it grew steadily in diversity and ambition. The fishing boats became quite large—the MARY E. PETRICH, launched in 1949 and named for founder Martin Petrich’s late wife, measured 150’

and was then billed as the largest tuna clipper ever built. It even included a chapel below decks. One of Western’s vessels, the 76’ purse seiner WESTERN FLYER, achieved literary fame when John Steinbeck accompanied a marine biologist on a collecting expedition aboard it and wrote *The Log from the Sea of Cortez*, his most important nonfiction work. (The boat, now severely deteriorated, is in the early stage of what the new owner estimates will be a \$2 million restoration; see *Currents*, page 18.) During World War II, Western built some 30 mine planters, minesweepers, and patrol boats. After the war the commercial division continued, branching into large steel-hulled boats and even oil rigs. And it launched the Fairliner division to concentrate on pleasure craft.

Martin Petrich’s son Allen was a racer, and the Fairliners pushed performance from its beginning. A 1948 magazine advertisement for the 26’ De Luxe Sport Cruiser touted speed of “up to 40 mph” combined



COURTESY OF JOHN LISICICH (BOTH)

Above left—NO KA 'OI's construction is fairly conventional for a runabout: She's planked in the batten-seam method, with longitudinal stringers let into sawn frames and plank seams aligning with these stringers. No caulking is required in the seams, the result being an eye-pleasing wood-to-wood fit. **Above right**—The boat's bottom has an inner skin of 1/4" plywood (shown being applied above) and an outer skin of 1/2" meranti. Between these layers is 3M 5200—a tenacious but elastic adhesive sealant.

swoopy and extravagant shapes, and they do, but that very quality of infinite plasticity too frequently lures designers into the lurid realm of excess and vulgarity. A skin of wooden planks imposes a discipline. The boat must have an organic form, a shape developed in concert with the innate qualities of the wood itself. It's as if the designer and builder negotiate a deal with the material, flattering it and wheedling it and wringing from it as many concessions as possible, but finally settling for a form somewhere within nature's tolerance. This Fairliner is what we get if we take art and

engineering and human ambition out to the far edge, as far as nature will allow. To move beyond this boat's architecture, we would have to leave the organic world behind—for plastics.

Viewed on the water, the boat assumes a different personality from every angle. It's remarkable how such a small boat can contain such a cast of characters. From abeam it looks remarkably cetacean, a hybrid species merging the snub bow of a sperm whale with the sleek, reverse-sheer body of an orca. Bow-on, it exudes menace, a hard, non-negotiating projectile. It's at its most

The Western Boat Building Co. was primarily a builder of large vessels. Among its most celebrated launches is WESTERN FLYER, the 72' purse seiner immortalized in John Steinbeck's *Log from the Sea of Cortez*. WESTERN FLYER is currently lying in Port Townsend, Washington, decrepit but on the verge of restoration.

with seagoing capability. "They take 'em out when others stay huddled in protected waters," the ad claimed. Allen Petrich's son Allen Jr. says a number of the big West Coast shipyards tried to punch into the postwar pleasure boat market, but he believes Fairliner "was about the only one to succeed." For a time, he says, the division was the largest builder of pleasure craft on the West Coast.

Allen Sr. finally embraced fiberglass, but too late. He had a heart attack right around the time that plastic was swamping the pleasure-boat industry and sold the company. He died in 1981, just a little too soon to enjoy the full bloom of the wooden-boat revival.

—LWC



PETRICH FAMILY COLLECTION

All of the boat's hardware is original—cleaned up and rechromed for the restoration.

alluring in the three-quarter stern view, where the streaming-away teardrop form of the long aft deck suggests more engine than it actually enjoys (though Lisicich did briefly ponder transplanting a Chevy 350). The shape exudes the purity of purpose of a no-frills formula racing car, while at the same time the deeply varnished meranti planking breathes of luxury. It manages to be these two things at once without apparent contradiction. There are Art Deco details such as the stainless-steel cutwater, but overall the ornamentation is fairly restrained, considering the era of its design. The most amazing detail has to be the ineffably fluid transition from sides to deck. If it weren't for the painted caulking between the deck planks, the whole boat would look as if it were carved from a solid block of wood.

From the forward cockpit, the token windscreen



comes up to about lip level. It feels very much like a 1950s race car. Sounds like it, too—the engine grumbles and snarls with more baritone authority than you'd expect from four cylinders.

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The sculptural stern is the hallmark of the Fairliner torpedo. The deck seams are caulked in white polysulfide.

remarkably tight, high-speed turns happen without drama or alarm. The designer was Dair N. Long, who collaborated with Western's president, Allen Petrich, to create, essentially, a postwar sports car for the water. Petrich's son, Allen Petrich Jr., says they "insisted on a design that if you were at top speed and turned the wheel as fast as you could in either direction, the boat would neither flip nor spin out."

It's an uncompromised design, an artifact from a time when boatbuilders did not employ marketing departments and focus groups. It's generally impractical and totally unusable for most of the nautical activities boaters today want to indulge in—you can't fish from it, tow a skier with it, or throw a beer party in it. There's no stereo, swim step, or Bimini top. There's no storage space whatsoever—if two passengers are occupying the aft cockpit, it will be tough even to stow a pair of fenders. But it's this purity of intent that makes it a work of art rather than a willing appliance.

A Fairliner Torpedo is about two things, period: goin' fast and lookin' cool. 🍷

Lawrence W. Cheek is a writer, teacher, and amateur boatbuilder based on Whidbey Island, Washington.



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Make Your Own Bronze Chart Dividers

by Erica Moody

Photographs by Joe Devenney

In a woodshop, metalworking can be a frustrating endeavor, with proper tools and skills not easily at the ready. But when a boat detail or structural element, or a shop-made tool, calls for knowledge of metal and how to work it, some basic experience will go a long way. The following project will give you that experience—along with a beautiful and useful pair of chart dividers made of bronze and stainless steel.

There are several styles of divider, some more complex than others. For this project, I've chosen the classic resistance-fit knuckle divider—the most common antique-style of divider. Its mechanism is simple, relying on the light friction of a hinge joint to hold the position of the legs while also allowing for easy adjustment. The tool is accurate and durable, and its construction

employs cutting, drilling, and filing—skills needed in the fabrication (as opposed to casting) of most traditional boat hardware. The project also introduces the crafting of a moving hinge joint, as well as the technique of butt-joining two very different metals by silver brazing—a process that results in an incredibly strong joint.

I chose bronze for the tool's main body—the upper legs—for its warm golden color that contrasts nicely with the stainless-steel tips. It's also a fairly soft metal so is easy to shape. I chose stainless steel for the working points because of its strength and durability.

Template

The project begins with a drawing like the one in

Above—Using just a few specialized metalworking tools, such as a center punch and a tap for cutting threads, you can make the elegant pair of chart dividers shown above in an average woodworking shop.



photo 1 above. The rough shape of the dividers is established here, and I've freehanded-in some design detail near the joint. You can use my drawing for inspiration and dimensions, but feel free to change it to fit your particular style—keeping in mind a few words of advice on shape that I offer at the end of this article.

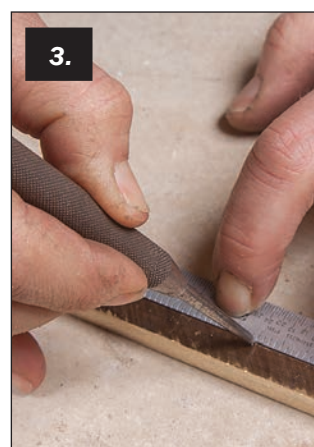
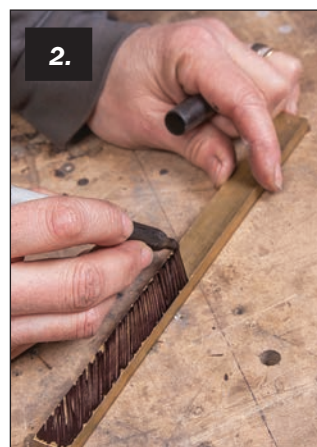
Before cutting any metal, work through most of the following steps using a template of thin cardboard like the one shown here; this will help you to understand how the pieces of the dividers work together, and what size of dividers works best for you. Pin together the pair of cardboard legs with a thumbtack or nail through the pivot point, and swing them to make sure they'll operate freely. If necessary, adjust the templates now to be sure they represent a good fit.

Bronze Upper Legs

Photo 2. Gather your materials and tools, and then cut two lengths of $\frac{5}{16}$ "-thick brass or bronze (see materials list for recommended alloys) bar stock to $\frac{5}{8}$ " x 5". Rough-file or use a rotary sander to shape each of these upper-leg blanks to a truly square rectangle, then color them black with a permanent marker.

Photo 3. Scribe a centerline down along the face of each piece.

Photos 4–5. Measure slightly more than $\frac{5}{16}$ " from one end along the centerline of each piece and lightly punch a divot in these locations with a nail or punch, then rest a compass in the divot and scribe arcs defining the top end of each leg.



Tools

Woodworking bandsaw with nonferrous-metal-cutting blade, for cutting bronze

Slow-speed bandsaw (around 200 rpm) or good hacksaw with a new metal-cutting blade, or a reciprocating saw for rough-cutting stainless steel. A jeweler's saw (like a handheld scroll saw) is also a very handy cheap metal-cutting tool to have in your shop. Buy one used and start with size 3/0 teeth blades.

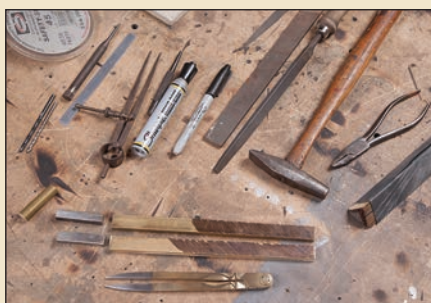
Good hand files (not wood rasps), one bastard/rough half-round and one medium half-round, and especially one thin medium flat ($\frac{1}{16}$ " thin is best)

Carborundum sandpaper, 120–220-grit. This is a durable and effective type of abrasive for use on metals, and it can be used either wet or dry.

MAPP handheld gas torch (it has a yellow bottle, rather than common blue propane plumber's torch)

Paste flux for brazing or grocery-store borax mixed into paste with water

45 percent minimum silver, cadmium-free brazing wire coil, preferably of $\frac{3}{64}$ " diameter (source: local welding supply or online; a very little bit lasts a long time)



Small, clean paintbrush or glue brush for applying flux

Tongs or pliers for holding hot metal

Fire brick or a piece of cement block for a non-flammable work surface

Drill (drill press preferred)

Thick black marking pen and sharp scribe (a nail or awl will do) for marking layout lines on metal

Angle grinder (optional, as most areas can be hand-filed, but an angle grinder with a 60-grit flat disc will speed things up)

Twist drills, sizes $\frac{3}{64}$ " and $\frac{1}{16}$ "

8-32 hand tap (a two-fluted one with tapered end is best)

Bench vise with wood-padded jaws

Small wooden hand-screw clamp

Fine household oil

A metal countersink (if a flat-head machine screw is used; not necessary if a round-head screw is used)

Safety gear: earplugs, cotton or wool clothes, leather gloves, safety goggles, tied-back hair, your wits clear and focused



Measure 1¼" down from the top edge of each leg and mark the 55-degree V shown in the drawing.

Photo 6. Use the divot to center a ⅝" drill bit, and bore a hole in the location of each divot. The drill's speed should be around 6,000 rpm (steel would require half that speed for this diameter bit). The drilling operation will leave a burr standing proud of the surface; file this away.

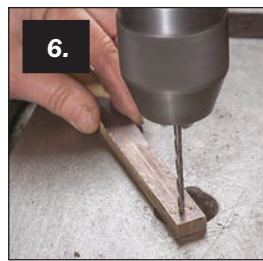
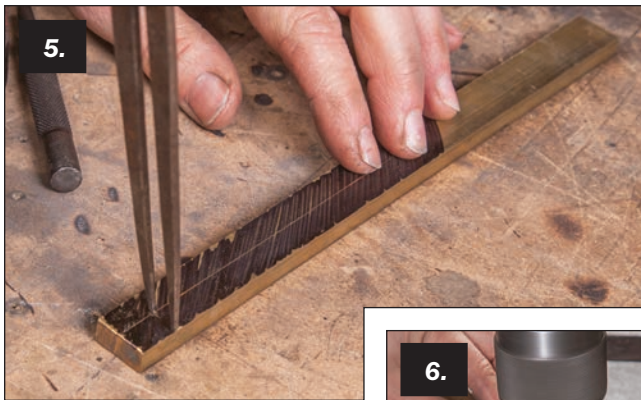


Photo 7. Cut out the scribed shapes (see the shaded part of my drawing), cutting outside the marked line and leaving the line visible to file or sand up to later). Rough-file these pieces flat, true, and parallel, but do not taper them or add any decorative detail—yet. Sand and file each top-end radius carefully, keeping in mind that it is essential to still keep the scribe lines visible.

Joining the Upper Legs

Photo 8. The dividers mate together with a sort of articulating mortise-and-tenon joint. Color the top end pieces entirely with black marker and lay out cut lines for the male (tenon) and female (mortise) mating surfaces. Divide the edges into lengthwise thirds, and X out the sections to be removed—the center portion for the female piece and the outer two thirds for the male piece.

Photo 9. Make a wooden jig, as pictured, to rest the pieces into for cutting the mating pieces at the correct (55-degree) angle and depth. Again, be sure to leave the scribe line visible.

Photos 10–11. After sawing, use a micro-thin flat file to finish up to the line, and keep refining until the two pieces fit together and the ⅝" drill bit can pin the pieces together and they can move smoothly. It may take some time filing and checking, filing and checking, but it is good to approach success slowly. You may also find you need to tweak the angle of the V-shape for best fit.

Once you are satisfied with this fit, drill the male piece and *only one tab* of the female piece with the ⅝" bit. This is the unthreaded through-hole for the 8-32 machine screw; the one tab that remains at ⅝" can now be threaded with the 8-32 hand tap. To do this, hold



the piece securely in the vise, and start the hand tap into the hole, keeping it straight and keeping firm pressure down into hole. Use several drops of fine oil as you go. It is easiest to stay straight if tapping vertically down into the hole, rather than clamping the piece sideways. After starting the tap into the hole a bit, make only about a quarter turn before backing up past where you started (you may hear or feel a chip break), then proceed forward again until you're a quarter-turn past the last stopping point. Keep repeating this process, and use lots of fine oil. Make sure you thread until you are past the tapered end of the tap. Brush the chips away, and then back the tap out of the newly threaded hole.



Bronze Hinge Washer and Nut

Photo 12. Cut the solid round bar slightly taller than the thickness of your parallel-sided wood clamp. Cut V-notches in your clamp, as shown in the photograph. Clamp the round bar with the wooden clamp so that one end is slightly protruding. File the rod's end square and true, and lightly break off or file any burrs on edge of rod. Flip the piece and repeat on its other end. The length of the rod does not need to be precise. Blacken the end of the rod with your marker, mark the centers on its ends, and then punch divots at these centers.

Hold the clamp (there's no need to clamp it to the table) on the drill press table with the bottom of the rod sitting flush with the wood clamp on table, and drill into the top end about $\frac{1}{2}$ " with the $\frac{1}{8}$ " bit. Countersink the hole until a flat-head screw drops in comfortably and its head is flush with the surface. This end of the rod will be the washer.

Photos 13–14. Flip the wood clamp over, shift the rod so the drilled end is now flush with the bottom of the clamp and resting on the drill-press table, and drill this end with a $\frac{3}{64}$ " bit; this hole is to be tapped. Again, drill about $\frac{1}{2}$ " deep. Clear any chips and tap this hole with the 8-32 tap, being careful not to try to go further than the hole is deep. Back out the tap often to clear chips, and be very delicate and slow and patient, or you will risk breaking the tap in the hole—in which case you can cut off that end of rod and start again.





Photo 15. An optional step is to drill two spanner holes with a $\frac{1}{16}$ " drill bit on this face as well (you can make the custom spanner wrench in the photograph with some stainless-steel wire of the same diameter as the holes). This end of the rod will be your custom lock nut.

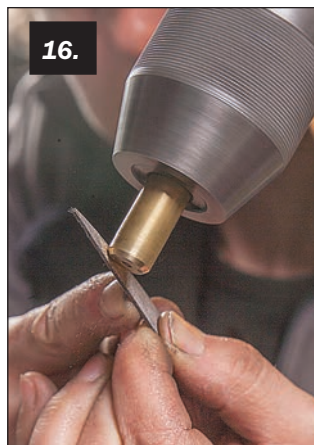


Photo 16. Remove the rod from the wood clamp, insert it into the drill-press chuck, and carefully use a file to chamfer the edges of both ends, as in the photograph. To guide this chamfering process, it's helpful to scribe a line $\frac{1}{8}$ " down from the cut surface. Be sure the angle of your chamfer doesn't come too close to your spanner holes.

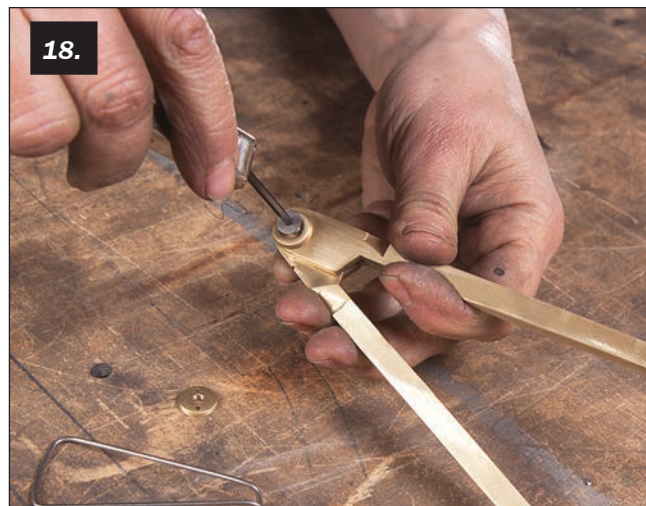
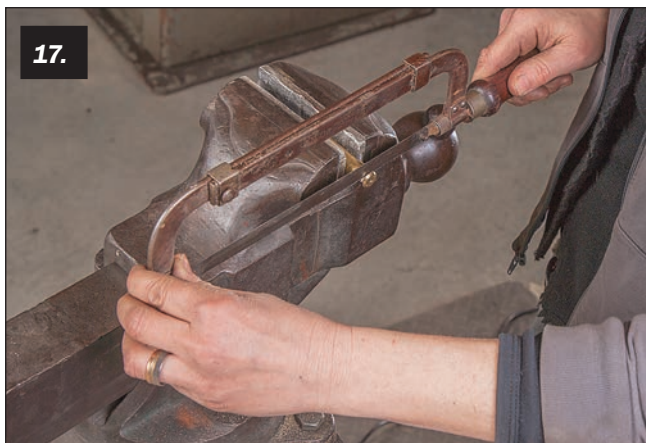


Photo 17. To cut the washer and nut from the round rod, use a bandsaw or a hacksaw, and cut where your chamfer ends; this will yield a washer and nut of about $\frac{1}{8}$ " thickness. To hand-cut with a hacksaw, file a small notch where you want to start your cut to keep the blade from slipping or straying as you begin. After cutting off your discs, smooth the saw-cut faces by placing them on a strip of double-stick tape or supergluing them to the workbench, and then filing or sanding. Gently chase the threads of the tapped nut with the hand tap again to assure a good, clean thread.

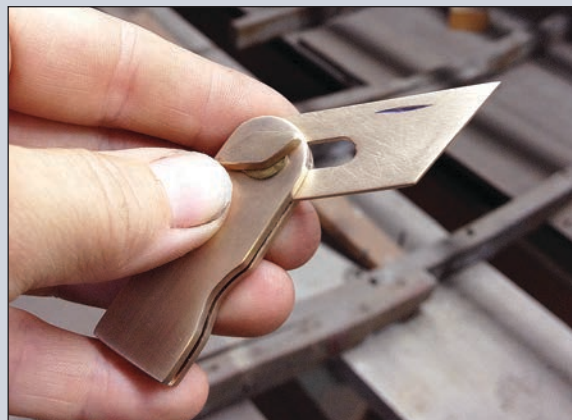
Photo 18. Assemble the dividers and tweak the fit and movement to your satisfaction. The tighter the nut is on the machine screw, the stiffer the adjustment. If binding occurs despite lock-nut adjustment, more filing may be needed on the mating surfaces.

Stainless Leg Points

Photo 19. Using a hacksaw or bandsaw, cut appropriate lengths for the tips from the stainless-steel bar; if you use a bandsaw, don't run it at more than 200 rpm or you will destroy your blade. Disassemble the dividers, square one end of each stainless-steel piece, and also square the ends of the bronze legs to which they will mate. A good, precise fit is crucial to a strong and clean joint. The width of the stainless steel should be greater than

Other Projects

Using techniques similar to those described above, a wide range of projects can be tackled—such as the boatbuilder's bevel gauge at right. If you wanted to make a fancy bronze tool with more durable tips, as in your own metal punch or scribe for all of your future metalworking endeavors, you can braze tips of tool steel instead of stainless steel, and then temper the tool steel (by heating and then quenching it) after it is brazed to the bronze. —EM





the bronze in all directions, if by just a bit; this avoids having to align the joint precisely. After the brazing operation, you will refine and true up the faces so the bronze and stainless steel appear as one.

Brazing

Photo 20. Set out your cement block chunk or firebrick and lay out one bronze leg and one stainless-steel leg tip. Brush a healthy dose of paste flux all over the mating surfaces and the surrounding area to keep the area clean and free of oxides during brazing.

Photo 21. Press the pieces together as tight as possible, and lean small bars or other convenient weights at the head and foot of the pieces to secure them down so they don't drift apart or move during brazing. Do not clamp the pieces.

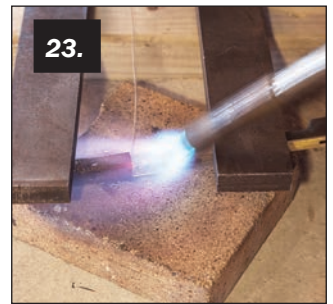


Photo 22. Have the brazing wire out and ready, light the MAPP torch, and heat about an inch on either side of the joint, getting each side to warm up at the same rate. Apply gradual, even heat to avoid creating hot spots. The idea is to bring the metal around the joint up to the correct temperature, and to not heat only the seam. The appearance of the flux will help you see temperature differences, so pay attention to it. It will start as a toothpaste consistency and then, as heat is applied, will go to a very dry, chalky look.

Photo 23. The flux will then change to a wet and cloudy appearance and, finally, to a clear watery state—which is when it's time to add the wire.

Before applying the wire, pull back the torch to give you time to place the wire end at the joint where you want it, and only when it's placed there should you bring back the torch and use a touch-and-go method to bring heat back up (on each side of the piece, not on the wire itself) until the wire melts into the joint. Gravity works in your favor here, so feed wire at the top of the joint.

Photo 24. Once a bit of wire melts off into the joint, pull your remaining wire away and evenly heat around the rest of the joint to allow the filler to flow into the joint fully. Resist the temptation to add more wire to the side where you don't see it flowing. This may cause you to have filler wire at the outside of the seam, but not through the middle. When feeding wire from only one location, it is more obvious that you have a successfully filled joint when you can see it come through the other side by heat and gravity alone. If the piece starts to get redder than a dull cherry red, back off the heat and slow down. If it becomes too hot, the flux, your protector, will burn away, allowing oxides to enter and destroy the joint. In this case, the filler wire will roll away instead of melting into the joint. If this happens, you





25.



26.

will need to stop, cool the workpiece, break it apart, and start again by sanding everything clean of flux, filler metal, scale, and dirt. Which is okay: Now you know for the next time.

The window of time that the flux is clear and watery—that the temperature is perfect for the magic to happen—is quite short. But, with patience and practice, it will get easier and more satisfying. After brazing, carefully quench your piece in water, dunking it again

and again to help pop off the now hard and glassy flux. A small wire brush or Scotch-Brite-type abrasive pad can also help clean off the flux. Be sure to clean up all flux from the workpiece and from your hands with water; it will rust your tools and harm your hands if left on them for too long.

Photos 25–26. Once you have a successful joint on each leg, file and sand to shape the leg points so the stainless steel is the same sectional dimension as the bronze, with all faces flat and true. I prefer starting with coarse (60-grit) sandpaper to bring the stainless steel flush to the bronze and for shaping the points. I then move to 120-grit, and then to an abrasive pad (a coarse tan-colored one), which leaves a nice, satin brush finish. Once they are mirror images

of each other, the dividers provide easier reference for the next step: decorative filing.

Photo 27. To create the decorative texture on the bronze portions of my legs, (see lead photograph, page 48) I used a small rectangular file and a round file. Keep in mind as you shape your dividers that the inside surfaces where the two legs touch when closed must, for aesthetic reasons, remain parallel. For functional

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27.



reasons, the points must remain the same length. With these things in mind, you can make a subtle detail like the one on the dividers shown here, or go wild with a more bow-legged form.

I hope this process gives you the confidence to know that with patience, a bit of knowledge, and not too much more equipment than that found in an average woodshop, metalwork can be incorporated into your woodworking.

With the skills acquired in making your dividers, you're ready to explore other metalworking projects, such as the one in the sidebar on page 52. 

Erica Moody has been a professional metal fabricator since 1994. She recently moved her studio, Magma Metalworks, from the Boston area into a late-1800s post-and-beam barn in the midcoast Maine town of Waldoboro. She also teaches metalworking at WoodenBoat School.

Materials

12" (minimum) length of bronze or brass plate, $\frac{5}{16}$ " thick; alloy 220, 360, 385, 655, 464 (sources: Online Metals; McMaster-Carr)

6" (minimum) length of stainless-steel flat-bar, $\frac{5}{16}$ " $\times$ $\frac{5}{16}$ " (or $\frac{3}{8}$ " $\times$ $\frac{3}{8}$ ") square bar; alloy 304 (sources: Online Metals, McMaster-Carr, Alaskan Copper & Brass Co. Might be listed under "key stock")

Several inches of $\frac{1}{2}$ "-diameter brass or bronze round bar (same alloy as the rest if color match is desired)

Flat-head (oval-head will work, too) bronze, brass, or stainless-steel machine screw, size 8-32 (source: local hardware store)

Scraps of thin cardboard or old manila folder of adequate size for templates

Bucket of water, for safety as well as convenience, for cooling hot metal

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COURTESY OF ROBERT GARRISON

Restoring a 1936 Danish double-ender— and reconstructing her history by Kaci Cronkhite

Despite many years of ocean voyaging, including a circumnavigation, I had never owned a boat of my own until 2007. On a blustery August day that year, a buxom 28' spidsgatter stole my heart. With 5'4" of headroom, she was just my size. "Am I crazy?" I whispered to myself as a photo of her started appearing on the computer screen on my desk in Port Townsend, Washington. "But she's perfect," I argued in reply. The boat, PAX, had been in the region for 20 years, but no one knew her. Was she Scandinavian? Who built her? Who designed her? How had she come to North America? No one knew.

I arranged to see the boat at the Royal Victoria Yacht Club in British Columbia. On her mooring, PAX was as stunning as in the pictures. But as the owner brought her toward the dock, my heart sank. Premonitions

flashed before me like still frames of a movie. My hand shook a little. She was 71. I was 46. She was a classic. Even though I had managed the Port Townsend Wooden Boat Festival for years, I was a wooden boat novice.

When I stepped aboard, she barely moved. To me, double-enders have the shape of safety, the feel of home. My heart quickened. The sails, deck gear, and rigging were tired, and the interior was sparse but functional. I listened as the owner described the new fir mast he'd built, last week's sail up to the Queen Charlotte Islands, his mock-up for a new cockpit. The heady scent of fresh varnish filled the cabin.

A colleague who had come along to offer advice lifted the floorboards and pointed at a weepy seam. From the rail, he pointed out a corresponding weathered copper patch at the waterline, like a 6" × 3" Band-Aid.

Above—PAX maneuvers through the fleet at the 2014 Port Townsend Wooden Boat Festival's concluding "sail-by," with author Kaci Cronkhite at the helm. Among her crew was Merete Lehmann (in the yellow windbreaker) of Denmark, daughter of the spidsgatter's 1938–1946 owner.



Like many wooden boat owners, the author kept expenses down by doing as much of the restoration work as she could on her own, taking advantage of the fact that Port Townsend's Boat Haven facility permits maintenance by owners.

people could make notes directly on the hull and left a clipboard near the boarding ladder for "comments and questions."

In a festival demonstration, her copper patch was peeled off to reveal signs of trauma and rot. Shipwrights weighed in. I knew all of the prominent boats and the "regulars" among the 200 boats at the festival. But now, a boat of mine played a role: She helped not only me but also others to understand how a patch might cover something serious. Now, I was an owner, an exhibitor, taking in every compliment and conjecture, acknowledging every smiling face and shaking head. What seemed like a crazy percentage of the 30,000 people at the festival freely offered advice. Then they were gone. I was alone with a boat I had only just met and barely knew, trying to piece together a conclusion about the way forward.

Deepening Relationships

I had known many Port Townsend boat-builders and marine trades professionals over the years, but now I was a client. The first round of invoices arrived. Shocked and starting to panic at the lengthening list of projects, I begged my lead shipwright, Diana Talley—a woman of 25 years' experience—for ways to keep costs down.

"Remove the ceiling," she advised, as we stood alongside the hull. Wild-eyed, I shouted at her in frustration. "There's nothing wrong with the ceiling! The project

"Probably need to replace a plank or two," he said. I nodded but stayed focused on PAX's motion; how stiff she remained as the two of us leaned outboard. "That's doable," I said.

The day being dead calm, we took PAX for a sea trial under power, leaving a wake etched like a bridal-veil train on a glass stage. She shouldered through a ship's wake, solid as the quarter horses I'd grown up on in Oklahoma. I saw no red flags. With the festival three weeks away, I didn't take the time for a formal survey.

I bought her.

In Port Townsend 10 days later, PAX started taking on much more water. Afraid she might sink, I hastily arranged a haulout at the yard next to my office. Within the hour, local boatbuilders, boat owners, and curious tourists swarmed around her. Buyer's remorse swept over me. It was my turn to feel like sinking. I struggled to stay positive while people poked, prodded, and voiced opinions. Too busy to listen well and completely overwhelmed, I set out chalk so



Diana Talley of Taku Marine, who efficiently managed PAX's haulouts next to her boatshop in Boat Haven, was one of many professionals involved in the boat's restoration.

JAN DAVIS (THIS PAGE)

Eric “Moose” Wilson, a caulker and shipwright who worked on fish boats and workboats in Alaska, Washington, and Oregon, caulked seams on PAX in 2011, just a month before he died.

can’t get any bigger!” Calmly, she took my arm. “Come up top.” I followed her around the stern and up the ladder. Inside the cabin, she pointed down. “Those are the ceiling planks,” she said. I nearly fainted with relief. Another wooden boat term learned, and a task I could handle myself at a savings. For the next two days, that’s what I did.

The relief was temporary. Removing the ceiling planking revealed her combination of sawn and steam-bent oak frames. Iron sickness was evident in one of the 22 sawn frames, a result of rusted fastenings and a less-than-perfect chainplate installation in the 1960s. With no permanent backstay, a jib, and a 51'-tall mast, 46' of that above deck, those shroud and running backstay fittings carried a lot of load. Judging by the number of boltholes in the frames amidships, it was obvious that chainplates had always been an issue.

Farther aft, another sawn frame and five steam-bent ones were cracked. Ideally, all should come out and be replaced with European oak, matching the originals. Without a timely source for the big grown timbers and without a lot more money, that wasn’t possible. I weighed the options. What was essential? What could wait?

Sailors pressed me to get her sailing. Craftsmen pressed for craftsmanship. Preservationists pressed for a return to the original configuration. Ashamed of my ignorance, struggling with the weight of conflicting



KACI CRONKHITE

advice, dying at the costs, and feeling trapped, I longed just to sail away. But there was no escape. I wouldn’t let PAX die there, and I couldn’t give up. I drew up a short list of essentials at an affordable budget.

Above the waterline, one larch plank was replaced and five white oak frames were sistered. Three areas weakened by iron sickness were fitted with graving pieces—often called “dutchmen” but which my crew took to calling “dutchgirls.” Portions of two sawn frames were cut out and replaced with local black locust scarfed to what remained of the original white oak. Outside, the bottom was sanded to bare wood and soaked with boat sauce. Rusting fastenings were removed, their holes repaired so she could be refastened with bronze screws and bunged. Old caulking was reefed out of half the seams for recaulking. One month stretched to three. Finally, the hull was at least sound for use in inland waters. PAX took everything I had: my time, my pride, and all my savings. Was this the worst decision of my life?

In February, six months after being hauled out, a rig-less PAX was lowered into the water, her interior bare, her cockpit empty. I was giddy. Friends and strangers came to watch. One brought a Susan B. Anthony \$1 coin for luck, and others brought flowers, cards, sparkling cider, pizza. As PAX was lowered to the water, amid my tears, their faces leaned over the pier like angels in the sky above. Then, PAX floated—and only a little clear, cold salt water trickled in through her seams. A stream of water around the shaft stopped when I tightened the packing gland. The colleague who’d been with me



KACI CRONKHITE

Amy “Shredder” Schaub, a 2007 graduate of the Northwest School of Wooden Boatbuilding, steam-bent white oak sister frames into PAX’s hull while serving as an apprentice with shipwright Diana Talley.

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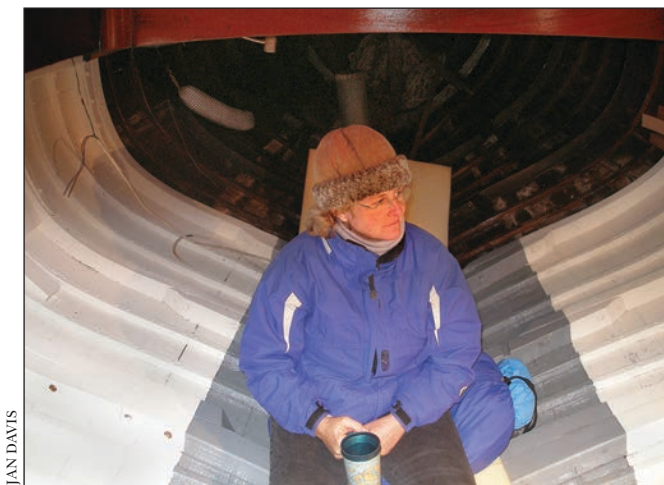


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JAN DAVIS

the day I first saw PAX hopped aboard, handed extension cords to people on the dock, and flipped the ends of the two bilge pump discharge hoses over the side. Even so, friends were clapping, smiling, talking to each other. They weren't afraid, and now, with PAX back in the water, neither was I.

For the next two days, I slept on the cabin sole. The pumps ran every 10 minutes, then every 20, then every hour as she took up. As I lay there in the bitter February cold, my spirit was restored. We'd done it. PAX had led me to new knowledge and a deeper appreciation of boatbuilders everywhere, and especially of Port Townsend's marine trades community.

Origins

In those hours, I also thought about her original craftsmen. I studied PAX's frames, traced the butt joints, admired the joinery. What hands first shaped those frames? Who spiled those planks? What was their community like?

The general view was that PAX was Danish-built, as were most spidsgatters. In 2009 I traveled to Denmark for the first time, determined to find PAX's history. I searched archives at the Royal Danish Yacht Club, Copenhagen Amateur Sailing Club, and Sundby Sail Club, and city records in Kalundborg. I met spidsgatter sailors I'd corresponded with, among them Henrik Effersoe, a respected expert who took me sailing on his beautifully restored BEL AMI.

Spidsgatters in Denmark were built to class racing rules based on sail area, and Henrik owns a 38-square-meter boat designed by M.S.J. Hansen and built by Karl Thomsen of Kalundborg. He believed she was likely a cousin of PAX's. He was as determined to find PAX's origins as I was and arranged for me to go aboard other Hansen-designed and Thomsen-built boats, among them the 45-square-meter SKARVEN, which Erik Nielsen has owned since 1976. The deck details

PAX's Danish builder, Karl Thomsen, completed his apprenticeship in 1915 and opened his own boatshop on the Kalundborg waterfront in 1932. He built at least 28 spidsgatters between 1932 and 1955; PAX was one of four he built in 1936.

After a cold relaunching in February, the author slept aboard for two nights to keep watch over the bilge pumps, during which she had ample time for dreaming.

were different, but these hulls were hauntingly similar. Going aboard felt completely familiar. Were these PAX's sisters? The answer seemed to be no; on my first trip, I found no records of PAX in Denmark.

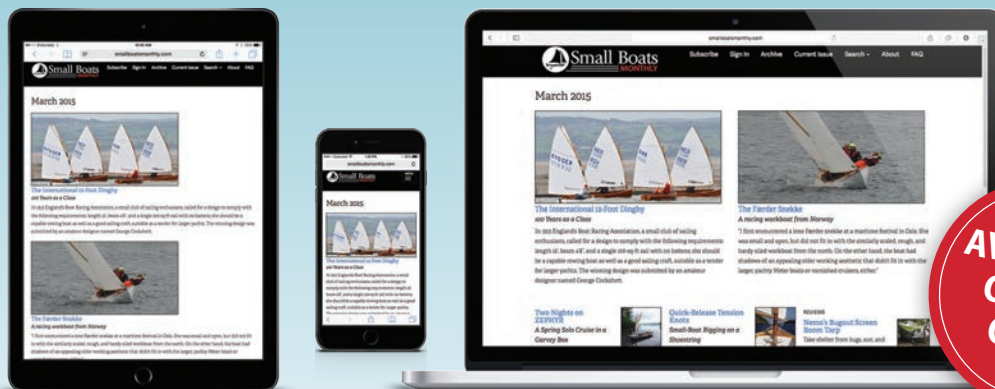
Over the next few years, I found out why. PAX was once named FIRECREST, which I hadn't known before. That information, together with early photos of the boat and her distinctive tiller—carved in the form of a fish—finally proved that, sure enough, PAX was built in 1936 by Karl Thomsen to a 45-square-meter design by M.S.J. Hansen.

On two more trips to Denmark, I found pictures of Karl Thomsen's boatshop in the city archives of Kalundborg. I stood on pavement near the railway station where the building once stood. I met Thomsen's granddaughters, great-grandsons, and his last living apprentice, now retired. They told me that Thomsen always chose boatbuilding wood himself in the Jyderup forest. He often worked alone. No more than a few apprentices were ever allowed in his shop. So PAX was the product of his own hands. Articles from as early as the 1930s called him a perfectionist. Hansen, the designer, had the same reputation, and together they produced fewer than 20 spidsgatters in various classes. In 1931, Thomsen built AGNETE, the first 45-square-meter, followed by two more (CHARLOTTA and SKARVEN) in 1934 and 1935. In 1936, he built four spidsgatters—a 38-square-meter, two 26s, and a 45—and today all are still alive, including PAX.

While talking with the owners and sharing their stories with Thomsen's family, one of his granddaughters, now in her 50s, concluded, "In finding PAX's story, you gave us ours."



COURTESY OF KARL THOMSEN FAMILY



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PAX, then called FIRECREST, sailed every summer in Denmark during the Lehmann family's ownership in the 1930s and '40s, even through the Nazi occupation. This 1938 photo was taken by owner Aage Lehmann of his wife and young daughter, Merete, sailing north from Copenhagen toward their summer home in Roskilde Fjord.

Caretakers

Mine is only the latest of the lives that have been intertwined with PAX. As I learned more and more about her, I found that there was more to restoration than woodwork and more to value than a pedigree. I could feel and see the love of others. Her wood was a witness. Someone made that hatch. Someone knew why those frames were broken. I vowed to find who those people were.

My search for PAX's history began where my personal history with her had started, on Vancouver Island. With some difficulty, I tracked down Janet Wylie, the only known previous owner, a mysterious and highly regarded woman shipwright who had owned PAX. There had been a serious fire on board in Sausalito, California, and she had rescued the derelict hull from the chainsaw. She trailered PAX to Bellingham, Washington, and spent five months installing a diesel engine, replacing keelbolts, reestablishing the sheerline, replacing the deck using plywood sheathed in 'glass cloth set in epoxy, building a new rudder, and installing new teak rubrails and toerails. She V-notched the plank seams, she told me, "to accentuate the beauty of the planking."

With her three young children and a dog, she then motored to Vancouver Island. For 14 years, she worked in a rustic boathouse, rebuilding the cabin, hatches, companionway, and cockpit coamings. No plans existed. She relied on her eye, badly overexposed black-and-white negatives of the burned-out interior, and the few remaining deckbeams to rebuild the cabin. She poured everything she had into the boat, then went cruising around the islands for years.

Her leads took me to California: a shipwright in Sausalito; a musician in Dana Point;

a couple in Laguna Beach. Over three years, I met former U.S. owners who had all loved PAX, and spoke of her elaborately carved tiller, of unforgettable sailing, and of her handsome curves. But bad things happened. Alcohol, cracked booms, damaged decks, fire, broken promises, and love transitions—the Sausalito shipwright lost his wife to cancer; the musician fell in love and moved to Italy; and the young couple sold the boat to buy their first house. None of the transactions between owners had gone smoothly. All were surprised and thrilled to know the boat was still sailing. The stories brought us all to tears. Apologies were made. Forgiveness tendered. The life-ring, bronze fittings, old files, and old pictures were dug out of closets and given to me, given back to the boat now known as PAX.

It was from the Laguna Beach owners that I learned about the former name FIRECREST. "The boat was his first love, so I had to be No. 2 from the moment we got married," the woman said. "We both loved that boat. He found her in Wilmington, at Colonial Yacht Harbor, where boats go to die." They had saved her, and their clue proved vital to solving the mystery of PAX's origins.

Via email, Svend Erik Sokkelund of the Sundby Sail Club contacted 100 Danish wooden boat enthusiasts, this time asking about a spidsgatter named FIRECREST. One, a retired judge in his 70s,

After a fire in Sausalito, California, destroyed PAX's original cabin and interior (inset), shipwright Janet Wylie saved the boat and transported her to Bellingham, Washington. She used the scant remains, old photos, and her design instinct to reconstruct the destroyed cabin and cockpit (below).



PAX is one of several Danish spidsgatters often seen sailing along the historic seaport waterfront of Port Townsend. The sail number S45 denotes her original racing rating for the class carrying 45 square meters of sail.

remembered FIRECREST and her carved tiller. He called his childhood sailing friend, Merete Lehmann, whose father, a dentist named Aage Lehmann, was the boat's second owner. She emailed half a dozen photos of the boat taken from 1938 to 1946. One showed her as a toddler, sitting on the companionway hatch holding her father's pipe while her mother was at the tiller. Every summer, the family sailed from Skovshoved, near Copenhagen, around the north end of Sjælland and into Roskilde Fjord, but she knew nothing of subsequent owners. In September 2014, Merete flew to Port Townsend and sailed once more on PAX. "I hope he can see us," she said of her father as we sailed. "It would make him so happy."

Just as I couldn't give up on the restoration, I couldn't give up tracing PAX's origins all the way back to the beginning. I knew that in 1936, cigar manufacturer Hans Christian Petry Bertelsen had curiously ordered two spidsgatters from Thomsen, the larger of which was a 45-square-meter named TONICA, that had only been listed for one year in the yacht registers before disappearing. Then, in 2013, during one last pass through the archives, Klaus Mathiasen found an error—a transposition of ownership—and by using engine specifications he was able to prove that FIRECREST and Bertelsen's TONICA were one and the same boat. It was the last piece of the puzzle from Denmark. Klaus called Bertelsen's grandson, and soon we had photos in hand. When I met the family in Copenhagen, three generations, by turns, read from the logbook of their

ancestor's voyage from Denmark to Belgium in 1937. That was the year he died, just one year after he had the boat built, explaining the brief entry in the registers.

The last owner in Denmark had the boat from 1946 to 1961. In 2014, I met Marlene Sandvad, who told me that her father and grandfather, Ole and Kjeld Sandvad, sailed all over Denmark and Sweden in those years. Then, the family sold the boat to an American, probably from Los Angeles, who so far remains an enigma.

In 2007, I had fallen in love with a beautiful boat. I gave her what she needed and sometimes all I had. In return, she taught me about boatbuilding, design, history, geography, and language and connected me with people in three countries who became friends and whose lives, like mine, were bent, steamed, and hammered into her hull. Together, we've been buoyed by her curves—the wood and craftsmanship touching our hearts across gender, language, class, and decade. Love, like a restoration, has no end on PAX. 

Kaci Cronkhite is a traveler, writer, sailor, and passionate contributor to wooden boat endeavors worldwide. She is working on her first book, about PAX and her history. Connect via Facebook or her website, www.kacicronkhite.com.



COURTESY OF ACE SPRAGG



KACI CRONKHITE

PAX has become a "regular" at the Port Townsend Wooden Boat Festival. The author was the festival's director from 2002 through 2011 and the managing director of the Northwest Maritime Center (visible in the background) from 2005 through 2010.

Aboard RAMBLER



A Muskoka Lakes yacht from another era

Text and photographs by Tim Du Vernet

The motoryacht RAMBLER is a boat of most unusual proportions: She measures 70' overall, but has only a 10' beam. Built in 1903 for Isabel Mckinnon by the Polson Iron Works of Toronto, she is a familiar sight on the three Muskoka Lakes: Rosseau, Joseph, and Muskoka. RAMBLER's owner keeps a cottage on Lake Rosseau, but the yacht is housed on Lake Joseph. In the following photos, she appears on all three of the lakes, which are connected.

RAMBLER is one of the few boats of her type to not only have survived, but to be renewed and enjoyed. She was built during a time when the Muskoka Lakes were not easily accessible, and large boats such as she were in the service of large family cottages whose residents required substantial enclosed transportation to cover the distance to their summer homes. Only three or four private yachts of her type remain in service in Muskoka, and only one other, WANDA III, was also built by Polson Iron Works. She has yet to be restored.

Why is RAMBLER so narrow? Because the only way she could be shipped to her launching site in Muskoka from her Toronto builder was by rail, a distance of more than 100 miles. The tunnels and underpasses of the route limited the width of cargo. She displaces 39 gross tons, and was originally powered by a mere 10-hp triple-expansion steam engine. As we'll see on the following pages, her machinery has since been updated, and she's been impeccably restored by Paul Brackley of Brackley Boats in Gravenhurst, Ontario.



Top—In profile, RAMBLER has the appearance of a grand yacht, with three separate cabin spaces, a canopy-covered aft deck, and upper-deck seating aft of the stack. Grandeur indeed abounds. **Above**—From the bow, however, RAMBLER's narrow beam gives the illusion of a much smaller boat.



A Distinctive Hull Shape

RAMBLER's hull, with its distinctive curved transom, was fashioned by Polson Iron Works of Toronto, a company founded in 1886 by the father-and-son team of William and Frank Polson. In addition to building steam engines, the firm built yachts, tugs, ferries, and other working and military vessels until ceasing operations in 1919. Several examples remain in service today, including TRILLIUM, an island ferry in Toronto; and KWASIND, a private tender of the Royal Canadian Yacht Club. RAMBLER is of composite construction, which is to say that her frames are of steel and her planking of wood—fir originally, and later replanked in mahogany.

A Symphony of Curves

The yacht's curved, bright-finished oak pilothouse is as distinctive as her transom. The subtly curved door we see here, with its similarly curved glass, leads from the wheelhouse to the forward deck. In her restoration (see page 67), custom cutters were milled to reproduce her distinctive edge profiles.





Anchor Stowage

The anchor rests on the forward deck, which is protected by a rubber mat bearing the yacht's name. The anchor, which was likely cast at the Polson Iron Works, has not been used in living memory, but the rode is coiled and concealed below deck, at the ready. There's no windlass, so setting and hauling the anchor would be by hand.



Three Separate Cabins

The yacht has three separate cabin spaces. The forwardmost one, seen here, is furnished with a dining table surrounded by tall-backed seats. While the other cabins, as we shall see, have paneled oak overheads, this one shows the white-painted, V-matched undersides of the deck planks. It's a wonderful space to socialize in comfort and enjoy the view.

The Aft Deck

RAMBLER's aft deck is a perfect place to enjoy relaxed, breezy summer cruises. The seams between the fir deck planks are payed with contrasting black putty; covering boards of oak define the deck's margin.



The Challenge of Restoring RAMBLER

Before her recent refurbishing by Paul Brackley, RAMBLER had undergone one other major restoration—in the mid-1980s, by Vic Carpenter. Vic was both a radical and a traditionalist who is better known for his custom sailboats (his shop, in fact, was called Superior Sailboats). But he also worked on the classic launches of Muskoka at a time when many of them required their first extensive restorations. On November 2, 1984, RAMBLER, barely floating at the time, was hauled out of the Muskoka Lakes and taken by flatbed truck to Port McNicoll on Georgian Bay. Once she was there, Vic and his wife, Hazel, replaced her hull, duplicating the original but deteriorated steel frames and replacing the fir planking with mahogany. The boat emerged from the shop in like-new condition.

By the mid-2000s, thirty years of use and exposure to the elements had begun to once again wear away at the magnificent yacht. When her previous owner, Tim Chisholm, died in 2008, RAMBLER's future was uncertain. She had some rot in her hull, and her finish was tired and worn. Bobby Genovese, who owns a cottage on Lake Rosseau (and also owns the vintage raceboat MISS CANADA IV—see WB No. 238), stepped up to the challenge. He recognized RAMBLER's historical and aesthetic significance and committed to bringing her back.

The second restoration was an unusually complex task because of where it was accomplished. There was much deliberation over hauling the boat to a proper shop as had been done with Vic Carpenter, or keeping her on the lake inside her boathouse. Ultimately, the boathouse option won out. The boathouse, however, is located on an island nearly 30 minutes by water from the nearest municipal dock—and its structure was in worse shape than the boat. The house also lacked the basic comforts and amenities of a workshop, such as heat, tools, and materials storage.

It took about 30 months, from October 2011 to June 2014, to complete the combined rejuvenations of both the boathouse and the boat. The first step was to stabilize the boathouse structure. Then the boat was hauled



on an ingenious custom lifting cradle that's built into the boathouse; the cradle rises, via a ratcheting mechanism, on a series of threaded vertical posts. (View a video of this mechanism in action on the extended content page of woodenboat.com.)

With the boat clear of the water, the boathouse was draped with plastic shrouds and curtains to battle against draft, dust, spiders, and bat droppings. Even with these shrouds in place, varnish and paint could be applied only when the ambient temperature was warm enough—which is to say during the summer and shoulder-season months.

The list of needed repairs grew as the boat was thoroughly surveyed: Rotted floor timbers, portions of bulkheads, and the canvas-sheathed housetop were deemed to need replacement. The oak house sides and trim, the fir decks, and much of the interior joinerwork and soles also required complete refinishing. There were also some modifications made to the interior: The outboard-facing settees seen on page 69 replaced a pair of more conventional inward-facing ones, and the galley was updated with a microwave oven, refrigerator, and new stove.

The yacht's systems also received an overhaul with new gauges and generator and, most significantly, bow and stern thrusters. Tom McKenzie, who cared for the boat under the ownership of Tim Chisholm, recalls one particularly windy day many years ago: "We were trying to get away from the dock at Gravenhurst during a boat show; we needed the help of several boats to pull us off because of the wind." The new thrusters have taken a lot of the pressure off the captain, though added to the boat's power requirements; a new dedicated charging system powers them.

Paul Brackley said that working in the boathouse was the greatest challenge of RAMBLER's restoration—but a worthwhile one, for the rejuvenated RAMBLER, an icon of the Muskoka Lakes, has begun a new chapter.

—TDV





Diesel Power

Next aft is the engine room. The engine's box, removed here for the restoration, serves also as a table. The engine is a 170-hp GM diesel—a replacement carried out many years ago under a previous owner. The conversion from steam opened up additional space for a galley, which is outfitted with a sink, microwave, refrigerator, and stove. There's also a head in this space.



A Centerline Settee

The aftermost cabin has bench seats along the centerline that face outboard, for viewing. The original glass windows in this and the other cabins slide vertically, Pullman-style, disappearing into pockets in the house sides and admitting gentle cooling breezes on hot summer days. Not all of the windows were operational before the recent restoration, and it was a challenge to get their mechanisms functioning again. The flag above the cupboard celebrates the yacht's century of service.



Paneled Overhead

Each space is finished in flat panels of varnished oak, which have acquired a warm patina over the past century. In the after two cabins, varnished oak overhead panels are fitted between the deckbeams, too.



Two Helm Stations

RAMBLER has two helm stations, one inside and another near the forward end of the upper deck. The upper one is the obvious choice for maneuvering in close quarters since it affords a clear view all around.



A Repurposed Smokestack

Aft of the upper helm, the smokestack now houses the diesel exhaust. The stack bears the owner's initials B.G., for Bobby Genovese.

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The docks and wharves of Muskoka's cottages were typically designed for boats smaller than RAMBLER, and as a result, she might face some challenging docking situations. With her long shallow keel, she tends to be blown sideways, so special care is required in close-quarters maneuvering. Originally propelled by only a large single screw, RAMBLER has since been fitted with bow and stern thrusters operable by remote control from anywhere onboard. One of the greatest challenges is bringing her into her boathouse, when the flagstaff must be laid on deck and the helmsman must duck to pass through the doorway.



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Originality

Throughout her life, RAMBLER has always been privately owned and has never been neglected or modified—apart from the engine conversion. Chrome railings, brass lights, cleats, and curved window frames indicate how much care went into crafting her. All hardware is original.

Of particular note here are the oak fenders hanging vertically along the yacht's sides (see page 64 for a clearer view of these). They are the traditional device on the gentle Muskoka Lakes where robust fendering isn't needed. They allow a boat to lie protected against a variety of docks and piers that may vary substantially in height. 📏

Tim Du Vernet is a professional photographer who has a passion for antique boats and the Muskoka wilderness.

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SIMON GRIFFITHS

Rigging and Tuning a Wooden Boat

The hull and rig in harmony

by Brion Toss

Every sailing vessel is an energy machine. The sails exist to catch energy from the wind, the spars and rigging exist to focus and transmit that energy to the hull, and the hull exists to deliver that energy to the water. As the recipient of all that energy, the hull is part of the rig. The deck is just another set of

spreaders, and the tension from the shrouds flows right down the weather side of the hull. It is vital that the hull can handle those loads. Traditionally built wooden hulls, as we shall see, present a special challenge.

When we tune the standing rigging, we seek to transmit energy more effectively. If the mast goes too far to

Above—Even a well-found yacht such as the K. Aage Nielsen–designed HOLGER DANSKE, launched in 1964 at Walsteds Baadevaerft in Thurø, Denmark, and now homeported in Kettering on the Australian island of Tasmania, can benefit from rig tuning.



Excessive rigging tension contributes to sheer deformation in way of the shrouds and running backstays—but it plays no role in “hogging,” or drooping of the ends. Hogging is painfully evident in this archival photograph of a fine-ended and lightly built Idem-class sloop, one of a fleet at St. Regis Lake in New York’s Adirondack Mountains. Dating to 1899, many of the boats have been through thorough restorations.

leeward, we get more weather helm. If the mast bends laterally, we get a less-efficient sail shape and a less-stable column. If the leeward shrouds are too loose, we get hull-damaging shock loads when we tack. If they are too tight, the hull is more likely to change shape, from the combined efforts of the chainplates’ upward pull and the mast’s downward push. This damages the hull, of course; it also interferes with a smooth and effective energy path to the water. So by tuning the standing rigging—and trimming the running rigging—we seek to make the rig and the hull act in harmony.

This is easier said than done. Designs can be informed by technology, amended by aesthetics, perverted by racing rules, and blurred by the passage of time. Hull types vary wildly according to purpose, local conditions, materials, construction methods, and level of engineering expertise.

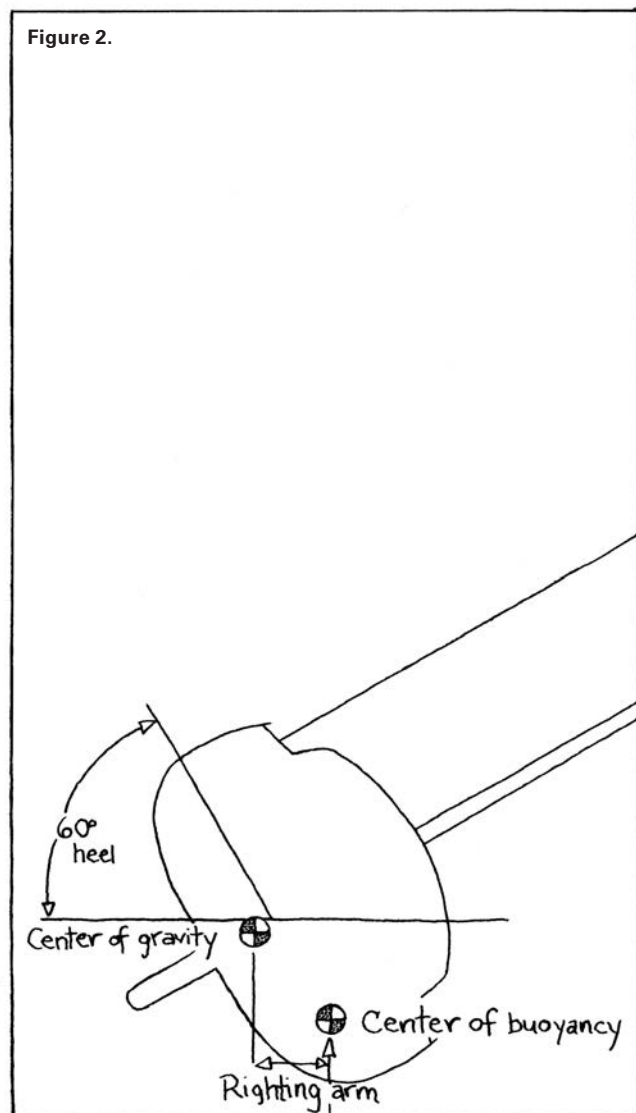
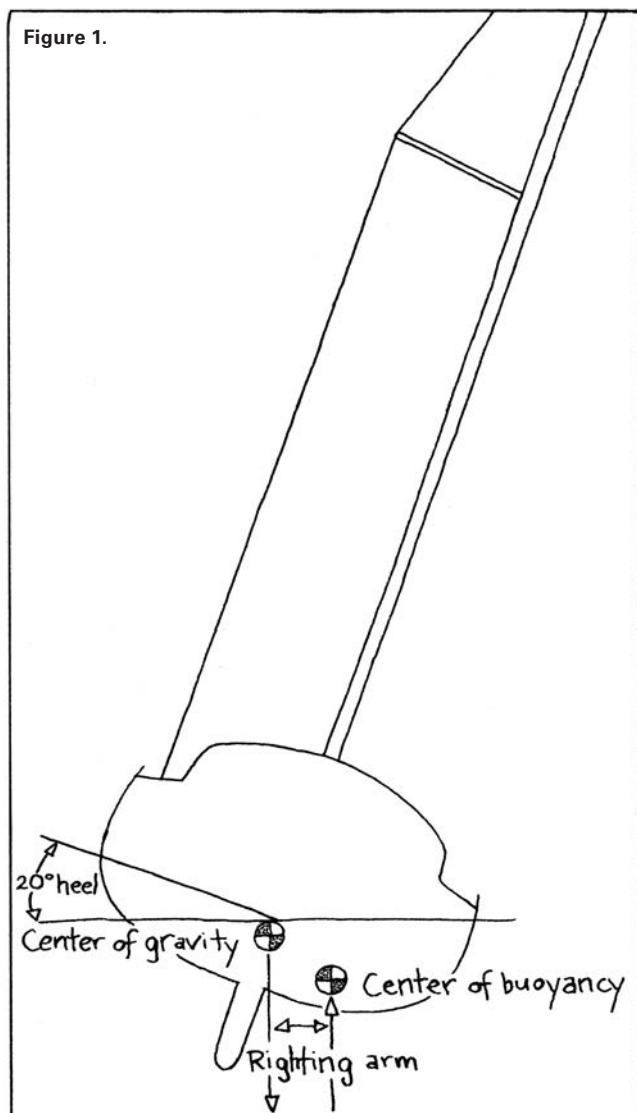
With so many variables, it is not surprising that proper rig tune for wooden boats is a topic of some debate. I believe that this is partly a matter of misunderstanding the principles behind tuning, partly a matter of entrenched prejudice, and partly a matter of the unique ways that traditionally built wooden hulls react when rig loads are imposed on them.

I will address all of these issues, but first I’d like to dispel a widely held myth: that tuning the rig on a wooden boat will cause the hull to hog. Hogging is the gradual drooping of the bow and stern, accompanied

by concavity in the run of the keel. It is an unfortunate phenomenon, both aesthetically and structurally, and it is often attributed to excessive rig loads. Explaining why this is just not so will serve as an introduction to principles, prejudice, and hull characteristics. It will also serve to get a particularly annoying untruth out of the way.

“Don’t tighten the rigging on a wooden boat, or you’ll make it hog.” This is why wooden powerboats never hog.... Oh wait, they do—and this is because hogging is the result not of rig loads but of a combination of buoyancy and construction. Buoyancy is not evenly distributed in most hulls, it is concentrated in the middle. The ends, being relatively fine—or sometimes extremely fine—are less buoyant and are cantilevered out from the middle. Carvel- and clinker-built boats, as Andy Davis of Tri-Coastal Marine once noted, are essentially huge wooden baskets, with planks and frames running roughly perpendicular to each other like weft and woof. The pieces can slide past each other, and they can separate. Most wooden hulls, as a result, make lousy cantilevers, so the mass at the ends tends to subside gradually. Hogging is the result.

Now granted, rig loads can deform any type of hull, but rig-caused deformations tend to be localized. For instance, shroud loads can cause a hull to pull up, or “hump” in way of the chainplates, and the more limber the hull is, the easier this is to do. Fortunately there are



ROSIE WILSON-BRIGGS (BOTH)

Figure 1—A typical sailing angle of heel of about 20 degrees imposes loads far below maximum. Figure 2—For monohulls, the greatest rigging load typically occurs at about 60 degrees of heel, and it is this load, with a generous margin of safety, that the rigging must be designed to withstand.

ways of reinforcing the hull to prevent both hogging and humping, as well as other forms of deformation. Meanwhile, with a clearer picture of what's going on in the hull, we have a chance at understanding the rig as a system.

The First Question of Rigging

We know that energy is traveling down the stays; the question is, how much? We cannot make meaningful rigging-size choices unless we know how many pounds of tension each component is expected to bear. If we choose inappropriately, we can get a rig that is difficult to tune effectively, or which has an insufficient safety factor, or which is so heavy that the boat sails poorly, or that is so expensive that we can't afford to sail at all. But rather than figure out what the load actually is, we are often tempted to go with what some old salt recommends, or what a similar boat has, or what "looks right." Even designers sometimes fall into this trap. Unless the

rig scantlings are based on actual loading, the odds of getting an optimum result are rather slim.

Inappropriate rig scantlings are a particular problem for old-time vessels and their replicas, because of an urge to do things "authentically," meaning the same size that that was used when the design or the actual vessel was new. Pause for rant: 19th-century wire was weaker and more ductile than the improved galvanized plow steel and stainless-steel we have today, which means we should be able to reduce rig scantlings accordingly, thus reducing weight, windage, hull strain, and so on. But it hardly ever happens. Somewhere along the way, we lost the connection between scantlings and loads. We distorted tradition, treating it as a set of instructions, or a mandate from above. It is not. Tradition is the evidence that people are paying attention to the important things. It is the receptacle of working knowledge, and it needs constant renewal. Rant over.

So what is the load? Well, it varies. In every boat,

loads are low when the winds are light, when there isn't much energy going into the sails. And loads are high when the winds are strong, sometimes putting so much energy into those sails that we have to make them smaller, or take them down altogether. But in every vessel that ever sailed, the loads are limited to what the hull can absorb without falling over. The general term for this is stability, expressed as the "transverse righting moment." The more difficult it is to push a boat over, the more energy it can absorb, and the higher the loads will be on the rigging. If you tune properly for typical sailing, the hull never sees a load significantly greater than its righting moment causes. In other words, the hull imposes those hull-deforming loads on itself. If you can't open the head door, or if your garboard is spitting caulk, it isn't entirely fair to blame the rig.

Stability varies depending on angle of heel (Figure 1). But at some angle of heel, the righting moment—and thus rig load—maximizes, and that is what we base our rig strength on. As you can see from Figure 2, the rig load for a typical monohull design maximizes at about 60 degrees of heel. Of course, no sane person would ever intentionally heel their boat that far, but you don't get to choose when that could happen; you have to assume it will, and build the rig accordingly. What this should give you, then, is a rig that is very strong relative to the loads it will see at sensible sailing angles, and adequately strong not to break if we ever suffer the misfortune of a knockdown. One nice consequence of this is that we can prestress (tune) our stays without getting them anywhere near their breaking strengths, and without imposing excessive loads on the hull. We get improved sail performance, dramatically reduced shock loading, and we still have a reserve of strength to deal with things like violent wave action, inefficient terminals, and some amount of materials degradation. Load-derived rig scantlings, in short, are crucial for meaningful rig tuning, as well as for the health of the hull.

The Hull

One more important consideration before we start tuning: maximizing hull strength. Good boat designers have long been aware of how loads can deform a wooden boat's basket-like structure, and they have taken steps to address the problem. In addition to load-based rig scantlings, and integral stiffeners such as clamps, stringers, and caulking, these steps can include:

- Extra frames in way of shrouds
- Double-diagonal bracing
- Vertical and/or horizontal tie-rods
- Hanging and/or lodging knees
- Structural bulkheads or ring frames
- Strapping that connects the chainplates to the mast heel
- Long chainplates, with multiple fastenings, to distribute load more fully
- Moderate overhangs
- Wider floors
- Longer and thicker maststeps
- Fractional instead of masthead rig

- Multi-mast instead of single-mast rig
- Eliminating the backstay
- Generous staying angles
- Suitable sail plan
- Good fastening and planking schedule
- Appropriate wood choices

Those are some of the tools that designers can use to take energy equitably into a wooden hull, without adding excess hull weight, or taking up valuable interior space. Some of these tools, such as tie-rods and knees, can be retrofitted to existing boats, but most of them are best included in the design stage. Even very good designers don't reinforce hulls adequately at times. To get an idea of how a master addresses this issue, take a look at the construction details for K. Aage Neilsen's 1964-built ketch *HOLGER DANSKE* (see sidebar, page 78).

It might seem easier, instead of building all this reinforcement into a hull, just to limit how much it gets loaded. Applied to older wooden hulls, this comes out as an admonition of, "Just don't sail it too hard." There is some sense in this, for some boats; we certainly don't want to take the *USS CONSTITUTION* out in a gale, for instance. But I am talking here not about museum relics, but about vessels that are still actively sailed. Any angle of heel under sail results in load on the hull. The hull needs to be able to absorb those loads without undue deformation. You can try to limit those loads, by keeping an eye on weather forecasts, by reefing early when the forecast is wrong, and by avoiding hard beats to weather. This is appropriate and commendable for an older or limber boat. But this can too easily be a way to avoid or deny problems with that hull, problems that can be addressed.

So far we have concerned ourselves with hulls that are carvel, strip-planked, and clinker-built because these are the most vulnerable to rig load deformation. But even double-diagonal strip-planked and cold-molded hulls, which are inherently much less limber, can benefit from anti-deformation design tools, especially where a quest for overall lightness undoes some of the hull's integrity. Wooden boat owners need not feel alone in this regard; any hull material can be overstressed if it is configured improperly.

We have also been dealing exclusively with monohull vessels, which are subject to far lower rigging loads than multihulls of comparable weight. In addition, even very stiffly constructed multihulls are almost always more limber than monohulls, because the forces are acting over much longer lever arms. Again, this is not exclusively a wooden-boat issue, but if you have a multihull, excessive limberness can be at least as deleterious to sailing performance and hull integrity as it is on a monohull.

This leaves one more area of concern: load intensity. If we have a given righting moment to deal with, we can reduce load intensity on the hull by spreading the sail plan out with multiple masts, increasing staying angles, adding stays, reducing aspect ratios, and so on. But all of these tactics also tend to reduce the vessel's ability to go to weather. That's why modern yachts tend to have, among other things, one high-aspect-ratio mast, with

A Case Study

When K. Aage Nielsen designed boats, among them the beautiful 42'6" LOA ketch *HOLGER DANSKE* of 1964, he was clearly aware that he needed to prevent the hull from deforming under the load of the rig. He started with a generous plank, frame, sheer clamp, and beam shelf scantlings. The bigger these pieces are, the harder it is to deform the hull. But if they are too big, the boat becomes too heavy to sail well. So Nielsen specified a series of construction details meant to stiffen the hull without adding excess mass. A by-no-means-complete list includes:

1. Inboard of the beam shelf, he added an "auxiliary shelf," notched to receive deckbeams, the better to deal with transverse loads. More on these later.

2. The chainplates have at least six fastenings each, to spread the shrouds' load onto a greater bearing surface of the relatively soft wood.

3. A broad metal backing plate, which completely overlaps the chainplates, distributes the load to a much greater area of planking. This plate (above right) is through-bolted to the frames and planking as well as to the chainplates themselves. It is a device that numerous designers favored, and one that Nielsen used routinely; the photo above was taken during the 1957 construction of another of his yachts, the 39' sloop *TIOGA*, at Walsted Baadevaert in Thurø, Denmark, where *HOLGER DANSKE* was also built using almost identical techniques.

4. To carry the load all the way to the keel and to keep the hull from twisting, four diagonal metal straps radiate downward from *HOLGER DANSKE*'s chainplates to the floors, while a fifth one angles aft to cover an otherwise unsupported area.

5. The generously proportioned floors are reinforced with metal covers and triangular metal plates, through-bolted to the lower planks and the lower ends of the frames. These reinforcements



COURTESY OF WALSTEDS BAADVAERFT/PEM NIELSEN ARCHIVES

Walsted Baadevaert followed K. Aage Nielsen's designs very carefully, documenting the construction. This photo of the 39' sloop *TIOGA* shows the metal plate backing up the chainplates and receiving diagonal hull strapping, exactly the same details used in *HOLGER DANSKE*. An auxiliary beam shelf, its top notched to receive deckbeams, helps prevent sheer distortion in way of the chainplates. Not visible here are the "stirrups," continuous metal bracing running from one side to the other something like a "roll bar," bolted to the bilge stringers and mast partner to preventing "squeezing" of the hull structure in way of the trunk cabin.

are at a critical focal area, where the upward pull of the shrouds meets the downward pull of the keel.

6. Most of the above details deal primarily with tension—the upward pull of the shrouds that is trying to deform the hull. But the shrouds also act in compression, trying to squeeze and buckle the deck. This problem, in *HOLGER DANSKE* and many other boats, is exacerbated by the yawning transverse gap in the deck created by the trunk cabin. To deal with this issue, Nielsen added the auxiliary shelf mentioned above but also created a novel structure he called "stirrups": long welded metal struts, bolted at their lower ends through the bilge stringers, extending upward to match the slope of the cabin sides, and arcing across its top just forward of the mast partner. This forms a sort of roll bar, keeping the deck edges from moving inward, keeping the trunk cabin from racking laterally, and returning some of the weather shrouds' upward pull back to the mast, leaving less pull to distort the garboards. It is a very elegant, very effective structure. But wait, there's more.

7. The cabintop in the way of the partners is further reinforced with a metal plate to distribute the considerable lateral load imposed by the mast at the partners, and the deck structure has horizontal tie-rods in the way of the mast as well.

The result of all of this structure is a hull that can better stand up to the loads that the rig imposes on it. And this is by no means a complete list of the options available to a designer. For example, the photos at left show another common solution: maststep tie-rods. Recently installed on the restored 8-Meter sloop *VARG* (see WB No. 239), these run directly from the chainplates to the stout maststep, transferring the pull of the shrouds to the maststep, thus "recirculating" it into mast compression.

—BT



A common way to reduce shroud loads on hull structure is clearly visible aboard the Johan Anker-designed 8-Meter sloop *VARG*, restored recently in Australia. Tie-rods run from knees at the chainplates to wings of the maststep (inset), all bronze in this case.

TOM JACKSON (BOTH)

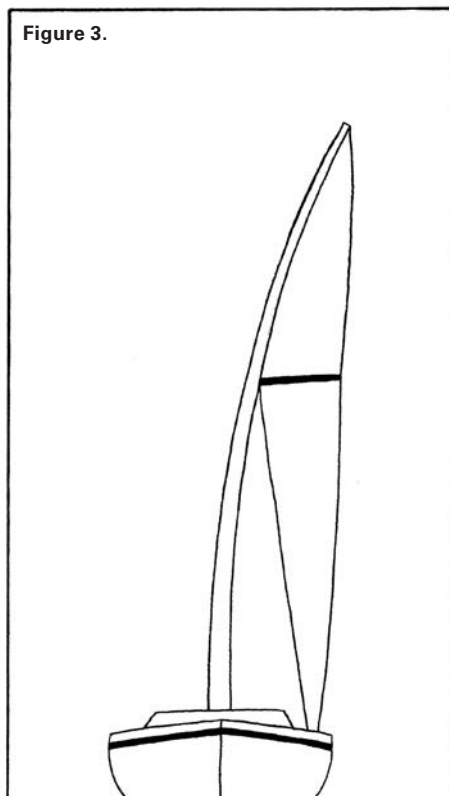


Figure 3.

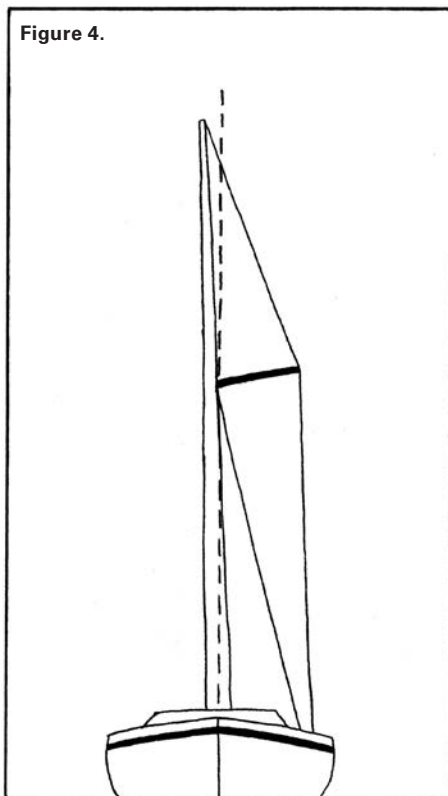


Figure 4.

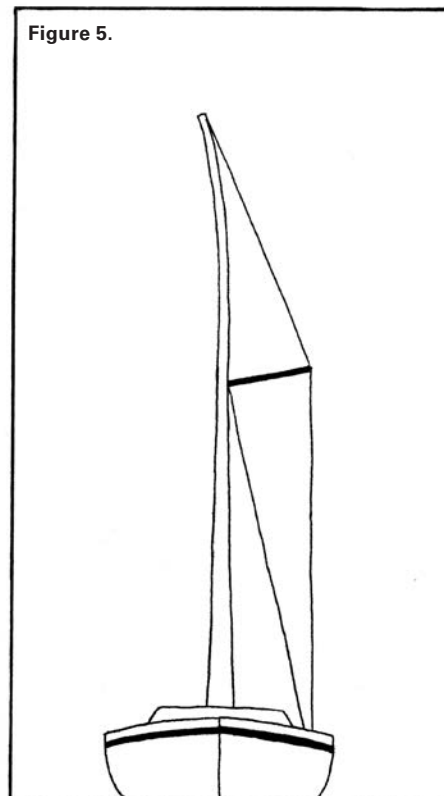


Figure 5.

Figure 3—In this hypothetical case of a mast rigged with shrouds only to the anticipated windward side, the mast is bent when at rest so that when the load under sail occurs, it will end up straight. **Figure 4**—If the upper and lower shrouds are tensioned properly, then when the wind fills the sails, the mast will be straight and leaning a bit to leeward. **Figure 5**—If the shroud tension is incorrect, the mast will bend when the sailing load is applied. The next step is to diagnose the problem. In this case, either the lower shrouds are too tight or the upper too loose, or both.

maybe two chainplates per side, well inboard. If you have a boat like this, it has to bear higher loads, in a smaller area, than in more conservative rigs. The hull had better be reinforced accordingly, in order to survive the sail plan's energy, and even then the sail plan might need to be limited in order to keep the input at an acceptably low level. Keep this in mind if you decide to "upgrade" an old wooden racing boat with a modern rig.

We can now, finally, talk meaningfully about tuning. I know, that was one long preamble, but I think you can see now that tuning is not something that you impose arbitrarily; it is the means by which the rig literally ties together all the components of the energy system.

How and Why to Tune

Let's start by assuming two things: that you have selected the correct wire sizes for your boat's rigging and that you have decided to reduce weight, windage, and expense by putting shrouds on only one side of your mast. If you did that, and if you tuned correctly, your mast, at dockside, would look like Figure 3. This is because tuning is largely a matter of anticipating how much the shrouds will stretch. When the rig is loaded up, the lower shrouds will stretch a certain amount, the upper shrouds will stretch a larger amount (because they are longer), and the mast will move to leeward.

If we anticipated correctly, the mast will be straight, and minimally to leeward, when the load and righting moment equalize, as in Figure 4.

If we anticipate stretch incorrectly, the mast might look like Figure 5, in which the head of the mast is further to leeward than the middle. This might be because the upper shrouds are too loose, but it is at least as likely that the lower shrouds are too tight, or that both are tensioned incorrectly. Regardless of the cause, anything but the result in Figure 4 is an incorrect tune, a faulty anticipation of how much the shrouds will stretch, that will have deleterious effects on the hull as well as on sailing performance.

We'll get to the particulars of anticipation later. Meanwhile let's put another set of shrouds on our boat, so we can sail on both tacks. If we do this, and tune correctly, the mast at dockside will look like the dotted line in Figure 4. The mast is straight because the shrouds are engaged in a balanced game of tug-of-war. This isn't very helpful, because even a very poorly tuned boat will look exactly the same; the proof of the tune, as with our one-set-of-shrouds version, is in the sailing.

Under way, just like before, the energy from the wind loads the weather shrouds, and they stretch. As they do, the leeward shrouds shrink, releasing their load. If we anticipated stretch correctly, the leeward shrouds, at some predetermined, advantageous angle of heel,

Figure 6.



Figure 6—Modern synthetic lines such as Spectra and Dyneema are sound choices for the standing rigging of wooden boats, since they have exceptionally low stretch and great strength in use, and impose lower loads than steel standing rigging over time when the boat is at rest.

mast stops moving. So you get weather helm, crew discomfort, shock loads on the system, and, ironically, no reduction of load on mast, hull, and rig compared to a properly tuned boat.

Now remember, this all assumes that the shrouds are properly dimensioned. If they are oversized, the added weight can undo any benefits of reduced elasticity (lower relative load), and just getting the slack out of larger wires can add needless load to the hull. If the rig is undersized, it will keep stretching no matter how we tune it, because the relative load is too high.

We also assume that the shroud material is suitably inelastic. If it is too stretchy, even the correct-diameter shrouds can behave much like undersized but less elastic shrouds.

Finally, we assume that the hull is in fact sufficiently deformation-proof. If it isn't, even a perfect job of tuning will leave the leeward shrouds slack, and the head door jammed.

We can get to a good tune through long, slow trial and error, but there are some dockside rules of thumb that can speed the process up: for the single spreader rig we've looked at so far, assume a tuning load of 15–20% of maximum on the upper shrouds, and 10–12% on the lowers. The uppers need to be that tight in order to compensate for their extra length; if we tuned them the same as the lowers, the resulting elasticity would leave the top of the mast hooked to leeward. The lower shrouds

need to be that tight because any slacker and they lose their tune too soon, going slack immediately to leeward. Get them to these relative tensions at the dock, and you can refine the tune as needed under way.

How do you know when you have those percentages? You can use load cells and tuning gauges, but unless you tune a lot of boats, it might not be worth the investment. You can also learn to tune “by ear,” which is not quite as esoteric as it might sound, so to speak, but requires some training and experience. Instead, you might try the method featured in Selden Mast's free tuning guide (see www.riggingandsails.com/pdf/selden-tuning.pdf), which is based on measuring the stretch in short lengths of wire. Full disclosure: I have produced a DVD on tuning that you might also find useful (see www.briontoss.com/catalog/videos.html).

Most rigs today are made of stainless-steel 1×19 wire, but the same principles apply to ones made from 7×7 wire, rod, or any other feasible material. One recent

will be almost—but not quite—dead slack, the weather shrouds will be feeling the load from the wind instead of the pull from the leeward shrouds, and the mast will be straight. This is of course great for sailing performance. It is also great for the hull, because the rig loads under way are almost exactly the same as they were at the dock. No roller-coaster of force and strain, no shock loads, no surprises.

Again, if we anticipate stretch incorrectly, bad things happen. If the shrouds are set too tight, when the weather shrouds stretch, the leeward ones don't release their load, so the weather shrouds—and the hull and the mast—feel the wind's force plus the pull of the leeward shrouds. The mast might also be pulled needlessly far to leeward.

If we tune too loose, the leeward shrouds release their load, and then some, going completely slack. This also means that the weather shrouds, tuned to the same degree, let the mast go too far to leeward before the



The author spent a good part of a day checking over the rigging for Philip Myer and Joy Phillips aboard their HOLGER DANSKE after serving as a symposium presenter during the Australian Wooden Boat Festival in Hobart in February 2015.

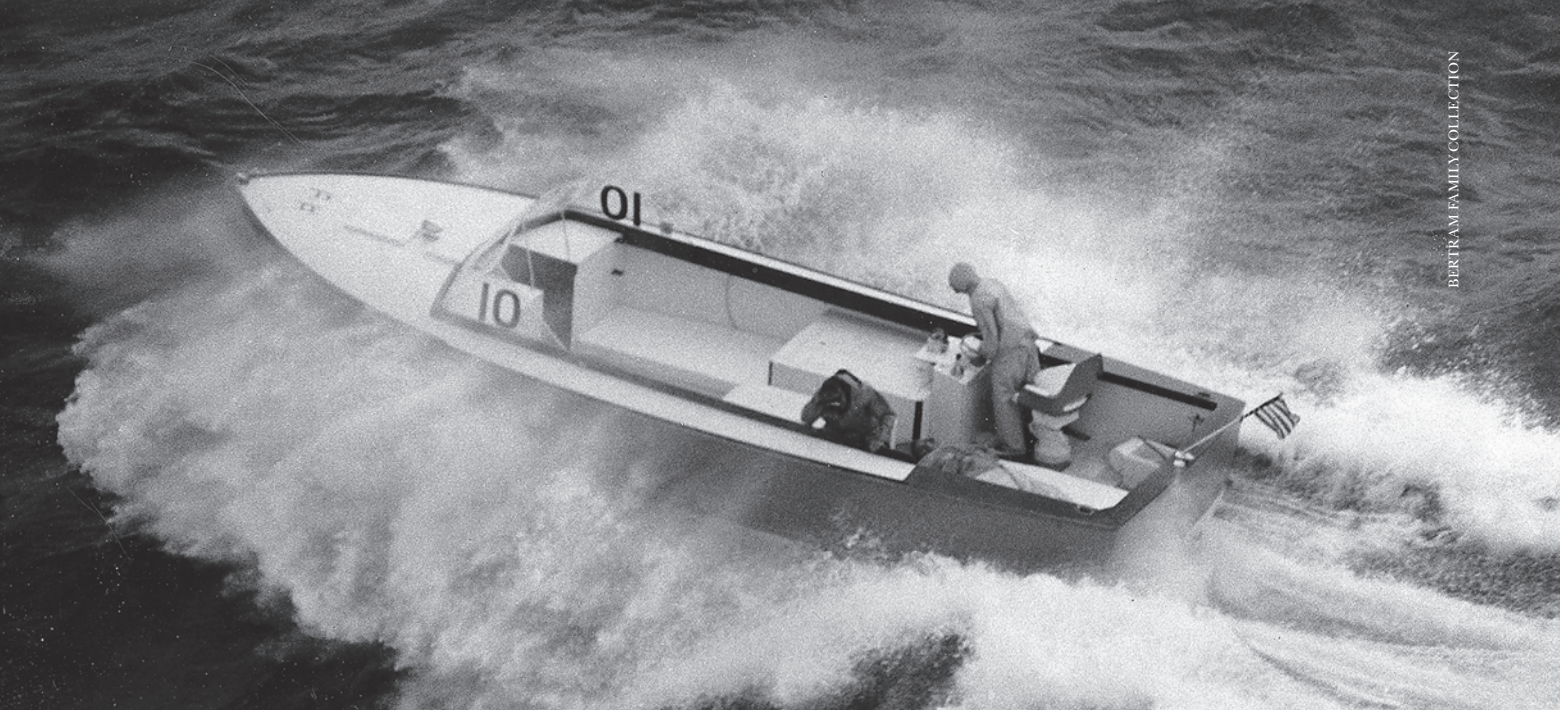


addition to the world of standing rigging is a heat- and pressure-treated form of Spectra/Dyneema, a high-molecular-weight plastic that can rival 1×19 wire for inelasticity, equal it for longevity, and far surpass it for lightness. Its one serious potential downside is that it can “creep,” or elongate, after sustained loads. This can be just about eliminated by keeping the working load under 15% or so of the breaking load. If you do this, you will have a rig that is far stronger than the appropriate steel rig and far less elastic. You will remember that tune is based on elasticity, so with properly scaled Spectra/Dyneema you don’t have to tune it as tight as steel, because it won’t elongate as much as steel. And this in turn translates into very good news for traditionally built wooden hulls, because though the loads under way will be about the same, the dockside loads can be much lower. The boat will also be appreciably faster and stiffer (meaning it will need to be reefed less often) than with a steel rig. To reiterate, not just any old form of Spectra/Dyneema will do for standing rigging; it needs to be specially processed to be sufficiently strong and inelastic. New England’s HSR and Colligo Marine’s standing rigging are the leading brands as of

this writing. Though very few riggers have learned how to handle this type of rope effectively, it is the coming thing, and very much worth considering for any wooden boat.

Whatever material you choose, or method of tuning you use, there’s a lot more to it than just tightening turnbuckles. You need to position the mast precisely before you start, and keep it straight as you proceed. You need to bend some masts fore-and-aft to get the most out of them. You need to treat multiple spreader rigs differently than single ones, and swept-spreader rigs different than ones with spreaders athwartships. In short, though the principles described above are quite simple, executing them on a given rig can be quite complex, and are well outside the parameters of this article. But really the tune is just the finishing touch, a refinement built upon the foundation that is the hull. 

Brion Toss founded Brion Toss Yacht Riggers in Port Townsend, Washington, www.briontoss.com, in 1978. He is the author of not only numerous articles but also books on rigging and ropework, among them The Complete Rigger’s Apprentice.



A Wide White Road

C. Raymond Hunt and the development of the deep-V hull

by Stan Grayson

On the morning of April 12, 1960, Dick Bertram boarded a 30' powerboat called MOPPIE. The boat's driver, Sam Griffith, proceeded to steer her into the smooth waters of Miami's Government Cut. Griffith had MOPPIE's two big Lincoln engines burbling away at just above idle speed as he and 22 other racers waited for 7 a.m., when the flag would drop and send everyone off on what the Bahamas Tourist Bureau billed as "The Most Rugged Ocean Race in the World." Also aboard was yachtsman and writer Carleton Mitchell, who had sailed with Bertram in the legendary yawl FINISTERRE to win three consecutive Bermuda Races.

All anyone knew before the starter's flag dropped was that this edition of the 185-mile Miami-Nassau Ocean Power Boat Race was likely to live up to its billing. A northeast wind had not subsided until the

previous day, and it was expected that 30-knot winds would still be blowing against the flow of the Gulf Stream. When the flag dropped, reported Mitchell in *Sports Illustrated*, "I was slammed back into my chair as Skipper Sam Griffith gunned the engines,

the fleet dropped astern and the wake stretched like a wide white road back toward our nearest competitors, a road that grew steadily longer." Outside the breakwater, the men donned diving masks for protection against spray and held on to what they could as Griffith opened the throttles. MOPPIE literally took off.

Nothing could really have prepared Mitchell for the violence of it. He had placed a tube of sunscreen 7' away and, for the next

seven hours, never felt it was safe enough to try to reach it. "The ocean," Mitchell wrote, "was as rough as I had ever seen it.... At times the effect was something like

Even to one unfamiliar with the type it was obvious she was a wonderful sea boat: 30 feet overall, built to designs by C. Raymond Hunt of Marblehead in the yard of Richard H. Bertram in Miami by workmen only recently from Havana, MOPPIE's underwater form was unusual—V-shaped not only forward but all the way back to the transom.

—Carleton Mitchell,
Sports Illustrated,
April 25, 1960

Above—In 1960, a 30' wooden powerboat called MOPPIE won a decisive victory in the 185-mile Miami-Nassau Race. That win spurred the wide acceptance of the deep-V hull form and in turn revolutionized recreational powerboat design.



C. RAYMOND HUNT ASSOCIATES

C. Raymond Hunt was the genius behind the development of the deep-V hull. His design accomplishments went much further than that though, as he is also remembered for several notable sailboats, including the Concordia Yawl and the 110/210-class sloops.

diving from a second-story window into a neighboring cellar piled with bricks....”

Griffith held the Lincolns’ rpm down as MOPPIE left the Miami skyline behind. “Mitch and I both marveled,” Bertram would later write, “at his judgment of the waves as he would throttle back just in time to keep us from leaping off a big one.... About an hour out of Miami, the two aluminum deck chairs on which Mitch and I were sitting disintegrated and were thrown over the side.”

MOPPIE’s wooden hull had been very strongly built, but 10’ seas, mechanical smarts, and the fact that no competitors were in sight suggested to Griffith—known as “Wild Man” to friends—that he throttle back to 15 knots. MOPPIE dashed along in this fashion, all alone for an hour, until they spotted spray to the north. The boat churning that spray was Jim Wynne’s 23-footer, AQUA HUNTER, with its two Volvo Aquamatic drives. AQUA HUNTER was named in deference to her two major pioneering concepts: She was being pushed along by a pair of stern-drives, a concept that was brand-new at the time, and her hull had been designed by C. Raymond Hunt. Hunt had also designed MOPPIE. Mitchell reported this impression of AQUA HUNTER: “His little vessel was coming off crests, leaping clear with sky showing beneath the entire length of the keel. MOPPIE promptly ran away from Wynne because of our greater over-all length and advantage in horsepower.”

Bertram’s boat, the big Lincolns turning 4,100 rpm in smoother water under the lee of the west end of Nassau, finished the race at 3 p.m., eight hours and ten minutes after leaving Miami. Not only was it a race record, but it also was set in difficult conditions. “She never once rolled a propeller out, something we had often experienced in other boats under similar conditions,” Bertram wrote. If anything, Jim Wynne’s arrival

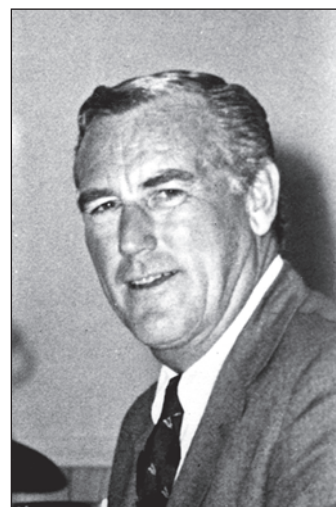
in second place two-and-a-half hours later was even more impressive, for his boat had less than half the horsepower of other racers. “It was,” Carleton Mitchell wrote, “a remarkable demonstration of the efficiency of the Hunt design in rough water.”

The “Hunt design” was the newly conceived deep-V hull form, and its performance surprised even Bertram and Wynne. They had anticipated they might have an advantage in rough seas offshore and in the chop on the Bahama Bank. But their boats had outperformed very powerful and well-proven competitors right from the start. In fact, it was not until the following day that the third-place boat arrived. Al Martin, a pre-race skeptic, told the *Miami Herald’s* Jim Martenoff: “I wouldn’t be a bit surprised next year to see a whole fleet of Hunt designs in the race.”

C Raymond Hunt was a yacht designer of boundless creative energy and extraordinary breadth, straddling the upper echelons of both the power and sail communities. Bill Wallace, reporting on the results of the Miami–Nassau Race for the *New York Herald Tribune* (April 17, 1960), observed that “The winner blended Gasoline Alley and sailing’s Hall of Fame.”

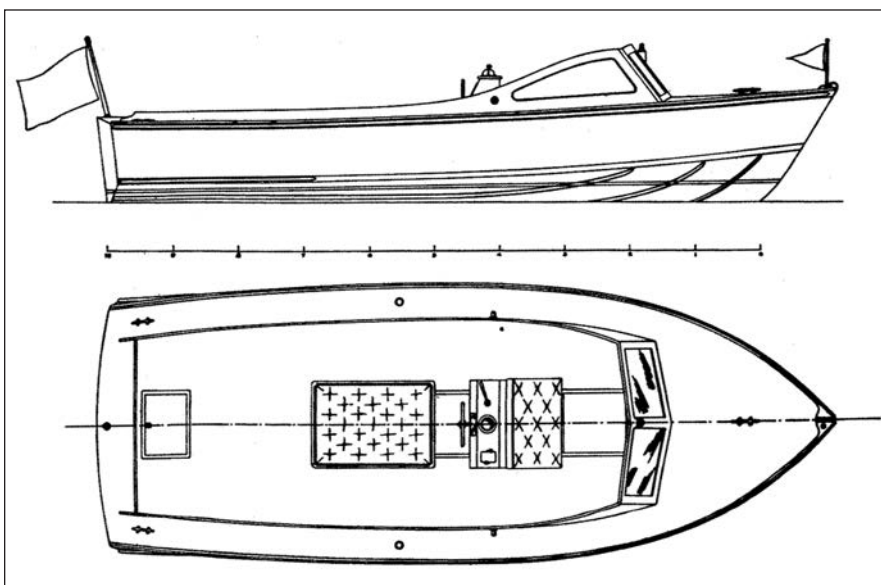
During the 1930s, Hunt had foreseen the market for an affordable racing sailboat and developed a most unusual design, the 110-class sloop. Their cigar-shaped hulls were built of plywood—an unheard-of proposition at the time—and were launched to much skepticism. Within a few years, however, the hard-chined, slab-sided one-design had become the dominant fleet on Massachusetts Bay and beyond. Illustrating his incredible range, Hunt designed the Concordia yawl, the quintessential New England cruising sailboat, in 1938—the same year he unveiled the 110. Following on the 110’s success, Hunt returned to a companion pre-war design, the larger but similar 210, in 1946. During the mid-1950s he developed with his lifelong friend Dick Fisher the small outboard-powered boat that became the 13’ Boston Whaler.

Dick Bertram, who like C. Raymond Hunt was an accomplished sailor as well as powerboater, commercialized the deep-V concept. His Bertram 31, the first of many production-built deep-V hulls, is today considered a classic.



BERTRAM FAMILY COLLECTION

Outboard profile of Hunter. The early wooden boats built to this design were equipped with centerboards (not shown), to assist in low-speed maneuvering.



Hunt had begun work on powerboats during the war years, but the 110 had its influence. Clifford Dean, a boat-obsessed youngster in Cohasset, where Hunt then lived, still recalls an encounter with him. Hunt told Dean that the hard-chined one-designs had an optimal angle of heel that would most effectively present a V-bottom when the boat was sailing. In this encounter, Hunt went on to muse about the possibilities of this shape in a powerboat. Hunt believed that a production powerboat that could run fast and smooth even in rough conditions would have a wide audience. He spent much of the 1950s pondering this idea, and by the spring of 1958 he knew he was onto *something*—probably something big. He'd been studying up on this. He'd been thinking. He'd been sketching out ideas for a hull form that would impress everyone as something distinctly new.

As a youth, Hunt was an unmotivated student, but when a subject fascinated him, he read whatever he could about it. Over time, he gathered together a small number of reference books that he used time and again. One was his daughter Yan's high-school physics book. Another was a collection of boat designs, including three of his own, called *Your New Boat* (Simon & Schuster, 1946). But the most important of the books he kept close by was Lindsay Lord's *Naval Architecture of Planing Hulls*, first published in 1946.

A Massachusetts Institute of Technology (MIT) graduate who earned an MBA at Boston University and a PhD in naval architecture from the University of the Pacific, Lord had developed an early interest in high-speed powerboats that resulted in a number of fast designs, some used in rum-running. During World War II, he achieved the rank of lieutenant commander and spent his time in the Pacific overseeing PT boats, a perfect assignment for a man of his background and interests. Later, working out of his office in Falmouth Foreside, Maine, he designed high-speed naval craft for both the Dutch and the Spanish navies.

Hunt was particularly drawn to Lord's negative opinion of the so-called "warped bottom"—that is, a bottom whose angle of deadrise flattens as it goes aft, ending with a nearly flat-bottomed transom. Lord favored a "monohedron hull"—one with a constant deadrise aft. Hunt's purchase of Lord's book led him to visit the author in Maine. "Ray Hunt came here shortly after the first edition came out," Lord told Mystic Seaport oral historian Fred Calabretta, "and a lot of questions he had. I spent a lot of time with him.... Whenever he

was doubtful, he would send the plans [of boats he was designing] to me for comment."

John Deknatel, who led Hunt's design firm for 45 years, called Lord "one of the innovative designers of the time. He used primitive model tests. Eventually, he concluded that you didn't want to have twist in a hull as the PTs did. He did towing tests to show that a hull without twist in the bottom was an improvement. His theory was that the hull should have a constant section from 'midships all the way aft. And he advocated a significant degree of deadrise. But he would change the deadrise depending on a specific boat, its application, the volume and equipment within the hull.

"Raymond's idea was different. He used the same amount of deadrise [on all of his boats] from 'midships aft. Intuitively, nobody knows how, he determined the deadrise should be 24 degrees. Today, with all our technology, we know this to be near-ideal. Also, rather than change that angle to meet the demands of different boats, he moved things around within the hull—engines, equipment, and so forth—to make the weight distribution work."

To prove his theory, Hunt designed the prototype for what perhaps would become the most influential powerboat ever built, a boat with a whole new level of performance. For decades, ever since the appearance of the first "autoboats"—the early runabouts—during the early 1900s, there had been the search for increased speed on the water. Long, narrow displacement hulls gave way to stepped hulls that would plane, to V-bottoms of various configurations developed by forward-looking and competent naval architects. These hulls combined speed with seaworthiness, but Hunt was onto a whole new level of performance.

The first two boats built to Hunt's new concept were each called HUNTER, and were built of wood at the Rhode Island yard of Sam Wharton. The design included a centerboard to improve maneuverability at low speed, but the board would lift up automatically when the hull reached planing speed. Hunt also conceived of using water ballast to improve stability at low

speed and while at rest. The patent document presenting Hunt's deep-V boats stated that he had conceived of the idea in 1956 and, in the spring of 1957, launched a 23' wooden prototype with a centerboard and a 'midship-mounted engine. A 16' outboard with a "water ballast tunnel" appeared the following spring. The first boat had, initially at least, surface-piercing propellers. Neither of the wooden prototypes originally had what would soon become the deep-V's most distinctive feature besides the deep-V itself: a series of longitudinal bottom strakes. Hunt devised these strakes as the way to both increase lift and add stability.

Designer Waltman Mayo Walters, who would go on to associations with Dick Bertram and speedboat builder Don Aronow, among others, remembered one of Hunt's prototypes. In a 2010 oral-history interview, Walters told Calabretta: "Deep-V boats are not stable at anchor, they rock around a lot, and so he invented this hole in the bottom of the boat and then a floor inside so that the whole underside of the floor could flood. But when you took off, the water would come out.... The boat was beautiful. He got into propeller design. I got to watch that because he had a surface-piercing propeller [with a shaft] that fed through the transom, not down underneath. And that worked pretty good."

Despite this experimentation, Hunt's vision for the deep-V concept was not in custom or semi-custom construction. Rather, he envisioned the design's broad appeal, and saw the potential in mass production. Hunt looked to Wharton for advice on who would be qualified to build fiberglass versions. Wharton was a dealer for Dyer dinghies, and he recommended as a builder the genial Bill Dyer, whose facility, The Anchorage, was located in Warren, Rhode Island. There Dyer had become one of the small group of New Englanders who, after the war, were pioneering fiberglass construction

as "the future of boating." At The Anchorage, Dyer had begun molding his famous dinghies starting in 1952. Best evidence suggests the first fiberglass Hunter was built in 1956.

Sam Wharton told V.B. Crockett that the Hunter was "the strongest Fiberglass boat ever built.... I've tried to break this boat up for two years and I'm tired of trying to do it." Urethane foam was injected into various areas to increase strength and reduce noise. The twin 42-gallon fuel tanks were built of fiberglass, and the boat's shaftlog and centerboard box were molded integrally with the hull to eliminate potential leaks. The board, controlled by a lever, was included to add lateral plane and improve maneuverability at low speed. It was also intended to dampen roll when the boat was stopped, so the owner could fish.

But the real revolution, in addition to the hull's V-bottom throughout, was in the hull's integrally molded stringers or strakes. These were the real attention-getter. Based on an interview with Hunt and Wharton, journalist V.B. Crockett described three benefits of the strakes: "(1) To help lift the boat so that she gains speed and rides on the surface; (2) To give added stability and reduce roll (the air between the stringers cushions the motion in rough going); (3) To roll spray down so that the boat is drier in heavy seas."

According to Hunt, two fiberglass 23' prototypes were built. Each had the centerboard and an engine mounted amidships. During the 1958 AMERICA's Cup trials off Newport, Rhode Island, one of these HUNTERS served as tender to the wooden Hunt-designed 12-Meter EASTERNER. The boat, flying the Eastern Yacht Club's burgee from a staff on the bow, was often driven by Hunt's son Josh, with Hunt's wife, Barbara, sometimes aboard. That's where people first noticed the design. Those who noticed the boat—and they



A production-built fiberglass Hunter. This boat served as tender to the wooden, Hunt-designed 12-Meter-class sloop EASTERNER during the 1958 AMERICA's Cup trials.



BEKEN OF COWES

While Hunt deep-V designs were being produced in fiberglass in the United States, Fairey Marine in England was building the boats in wood. THUNDERBOLT (above), a Fairey-built 25-footer, won the 190-mile Cowes–Torquay Race in 1961.

were many—observed how smoothly it ran in rough seas without reducing speed. At rest, it looked like a displacement hull, but then as it gained speed the boat lifted out of the water in a manner nobody had ever seen.

Among those impressed by HUNTER was Miami yacht broker Dick Bertram, who was then in charge of the foredeck of VIM, the oldest 12-Meter in the trials. Bertram never forgot the moment he saw HUNTER: “It was about 11 a.m., July 16, 1958.... The wind was blowing a good twenty-plus knots out of the southwest. Seas were running six feet or more. Great weather for 12-Meter sailing, but a little rough for the wallowing powerboats.... Well, something very special came hurtling across those six-foot crests. It was Ray Hunt’s deep-V prototype.... Knifing through those six-foot seas at thirty knots, this little 23-footer stopped every sailor in the fleet in his tracks. No one had ever seen powerboat performance to approach it.” Seeing the boat changed Dick Bertram’s life.

Another who noticed HUNTER was V.B. Crockett, a journalist and yacht designer who knew a good story when he saw it skipping across the wavetops. Wondering how a boat with such a pronounced V-shaped bottom could possess the necessary stability and not squat awkwardly at high speed, Crockett promptly visited Hunt in his Beacon Street apartment in Boston. He then wrote an article published in the July 1958 issue of *The Skipper* entitled “Revolution...Hunt Style, New Power Boat Design Counters Old Theories.” He quoted

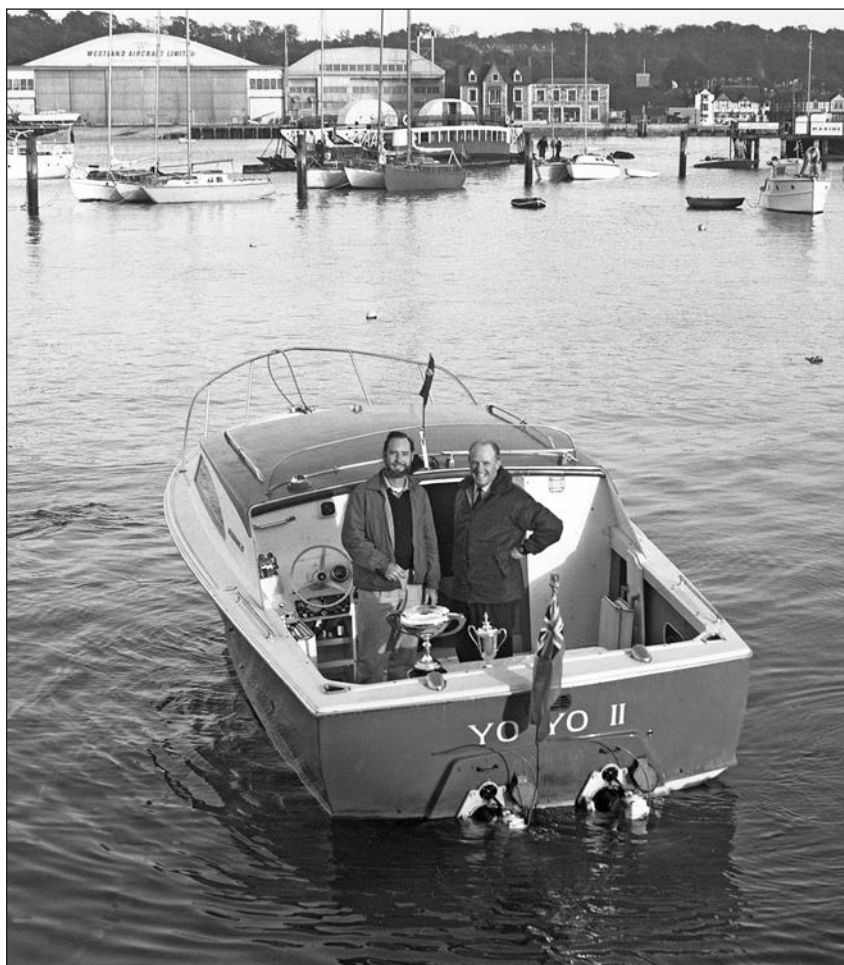
Hunt: “She’s quite a bit different than the usual power boat, isn’t she?”

Crockett described the hull as “a modified V-bottom boat that doesn’t have the usual long, flat run common in the conventional boat. Her entrance is easy and her deadrise is carried at nearly the same angle from amidships to the transom. This gives the underbody a deep vee extending the length of the hull.” Soon, wherever men gathered to talk about speed on the water, they would use this new term, *deep-V*. Within the marine industry, and among knowledgeable powerboat enthusiasts and racers, the term would always be identified with C. Raymond Hunt.

At the time *The Skipper* published this article, Hunt was willing to talk about the boat, but the profile and plan-view drawings he supplied to the magazine were accompanied by the comment: “Designer Hunt has released only partial plans.” Although he remained, throughout his life, overly casual about financial and administrative matters, Hunt did plan to patent his deep-V idea. He was aware of his design’s potential and believed he was giving Crockett only an intriguing glimpse of his new boat.

Because of Hunt’s planned patent applications, he did not answer Crockett’s logical questions about stability, or an unasked question about low-speed maneuverability. But Hunt, as noted earlier, had addressed these matters with a centerboard and with water ballast.

A decade later, when Hunt provided evidence in defense of his patent on the deep-V hull, he didn’t



The Bertram-built YO YO II finished second to THUNDERBOLT (opposite page) in the 1961 Cowes–Torquay Race. She was powered by twin Volvos, with a total of 200 hp. Her propellers spun on a pair of newly introduced stern-drives, which combined the benefits of an inboard engine with the maneuverability of an outboard.

Hunt's friends and admirers in England were just as impressed by the results of the 1960 Miami–Nassau Race as were observers in the United States. At his house in Cowes, Sir Max Aitken decided it would be a grand idea to have a similar long-distance event in the U.K. The race—over a punishing course from Cowes to Torquay on the Devon coast—would be sponsored by Aitken's newspaper, the *Daily Express*. A prize of £1,000 and the Lord Beaverbrook Challenge Trophy would be awarded to the winner.

"This race," reported *Yachts & Yachting* on September 8, 1961, "was something of a triumph for American designer Ray Hunt, possibly better known over here for his beautiful and successful sailing boats, for the first four finishers were to his designs." The top boats

were built by Bertram or by Bruce Campbell's Fairey Marine, which had acquired the U.K. rights to Hunt's deep-V.

Although the initial Fairey-built models—constructed of hot-molded plywood—had included the retractable centerboard, this soon proved leaky and troublesome. Revisions were made to produce what Fairey marketed as its Christina, a 25-footer powered by twin Crusader V-8 engines, each producing 325 hp and driving 14" × 17" propellers.

The winner of the 1961 Cowes–Torquay Race was Tommy Sopwith, driving his THUNDERBOLT. Uffa Fox described Sopwith's performance in his book *Seaman-like Sense in Powercraft*. Fox called Sopwith—son of the AMERICA's Cup challenger T.O.M. Sopwith—"a most capable seaman, steersman, and navigator with a very great deal of courage. He drove this boat around a 190-mile course, through high grey seas with white breaking crests, without knowing whether he was ahead, astern, or where the rest of the fleet was; all had been swallowed up by seas and flying spray and it was not until he had finished that he learned that he was the leader and winner of the race."

In second place was Jim Wynne, driving the far less powerful, Bertram-built YO YO II, with twin Volvo Aquamatics totaling 200 hp. "That they came in second was a great feat for men, boat, and engines," said *Yachts & Yachting*.

mention that a third fiberglass hull had been built, apparently by New Bedford's Palmer Scott, whose Marscot Plastics was a pioneer fiberglass boatbuilder. After that company's assets were acquired by a boat-obsessed Boston insurance broker named George O'Day in March 1958, O'Day concluded an agreement with Hunt, gaining the rights to sell the deep-V boats. This agreement, however, never developed. Crockett's article in *The Skipper* noted: "The Anchorage, Inc. of Warren, Rhode Island, will continue to build the Fiberglass hull. Fairey Marine, a subsidiary of Fairey Aviation, Ltd., in England will build the same design in England using plywood for the hull." Ultimately, though, it would be Dick Bertram, and then others, who would realize the sales potential of the deep-V.

The Marscot-built hull, it is believed, was sold to Florida boat racer and stern-drive pioneer Jim Wynne, probably in 1959. After a trip to Sweden, Wynne had received enthusiastic backing from Volvo for his inboard/outboard concept that uniquely combined the advantages of an inboard engine with the maneuverability of an outboard motor. Volvo marketed its inboard/outboard under the brand name Aquamatic. Those stern-drives, incidentally, neatly eliminated the very real maneuverability problems that journalist Crockett had wondered about. After refitting his new boat with stern-drives, Wynne drove it to the second-place finish described at the beginning of this article.

Soon after his 1958 encounter with HUNTER in Newport, Dick Bertram purchased a 23-foot Hunter, intending it for family use around Miami. Bertram was a high-roller who could afford to do as he pleased. When *The Saturday Evening Post* profiled him in 1961, he claimed to have brokered \$5 million worth of used racing motorboats in the previous year. He was known to some of the world's wealthiest men, including Aristotle Onassis and the Aga Khan. "His outfit," said one of his rivals, "has all the gimmicks, big parties, big ads, big talk."

When Bertram showed his HUNTER to his friend Sam Griffith, a renowned powerboat jockey, Griffith's reaction was, "I didn't think it would run at all. I told Dick Bertram he was wasting his time." But no one really knew what they were looking at. "We looked it over," boatshop owner Al Martin remembered. "None of us thought it would work. We laughed at it."

As he got acquainted with his new boat, however, Bertram became ever more convinced of its potential. He was so enthusiastic that he commissioned Hunt to draw up lines for a 30-footer, to be built in wood. This boat, MOPPIE, was built in 1959. After its astounding victory in the following year's Miami-Nassau Race, it served as the plug for the mold that would shape the hulls of the Bertram 31 sportfisherman—the first true production powerboat with a deep-V hull. These molded fiberglass hulls, born from a legendary wooden boat, had

a profound influence upon the future of powerboats—an influence that echoes far and wide to this day. They were revolutionary, both in hull material, and in hull design. 

Stan Grayson is a regular contributor to WoodenBoat.

This article is adapted from the author's forthcoming biography of C. Raymond Hunt, A Genius at His Trade: C. Raymond Hunt and His Remarkable Boats, to be published in October by Old Dartmouth Historical Society/New Bedford Whaling Museum. The book will be distributed by Tilbury House Publishers (www.tilburyhouse.com) and will be available from The WoodenBoat Store (www.woodenboatstore.com).

C. Raymond Hunt's development of the deep-V hull form was paralleled in England in the late 1950s and early 1960s by Renato "Sonny" Levi's deep-deadrise hull form. You can read an overview of Levi's pioneering work in Professional BoatBuilder No. 135 (February/March 2012). The current issue of PBB (No. 155) includes a roundtable discussion of several powerboat designers offering further insights into powerboat-hull development—including their associations with Hunt. Back issues of PBB are available from The WoodenBoat Store in both print and digital formats.




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LAUNCHINGS

Edited by Robin Jettinghoff

These pages, along with the Boat Launchings section of www.woodenboat.com, are dedicated to sharing recently launched wooden boats built or restored by our readers. If you've launched a boat within the past year, please email us at launchings@woodenboat.com, or write us at Launchings, WoodenBoat, P.O. Box 78, Brooklin, ME 04616.

Please include the following information: (1) the boat's length and beam; (2) the name of its design class or type; (3) the names of the designer, builder, owner, and photographer; (4) your mailing address along with an email address or phone number; (5) the port or place of intended use; (6) date of launching; and (7) a few sentences describing the construction or restoration. (8) Send no more than five photographs (jpg images at 300 dpi) and enclose a SASE if you want anything returned.



MICHAEL STUMP

Michael Stump of Yakima, Washington, designed this 34' expanding-hull catamaran in 2001 and spent the next 13 years building her. CHRISTIE LU folds to just 8' wide on her trailer, and expands to a 16' wide in the water. She has berths for six, draws just a foot of water, and moves at 10 to 12 knots with her 40-hp outboard. Contact Michael at mpscj2@gmail.com.



JOE MCCARTHY

Boaters on Candlewood Lake in western Connecticut might see Jeremy Dill's newly launched LEGACY, a 15' Charles Wittholz-designed catboat, flying her tanbark sail. In 2000, Jeremy bought the partially built hull from a gentleman unable to finish it, and worked part time over several years to complete and launch the plywood hull. He reports that she is a lovely, stable sailer. Plans are sold at www.woodenboatstore.com.

Six students worked with instructors Ejler Hjorth-Westh and Todd Sorensen to build this 20' River Dory in a three-week-long class. The 6mm okoume plywood glued-lapstrake planks are riveted to frames and gunwales of white oak. The seats and stems are Honduras mahogany. Ejler created this seaworthy design for the waters of California's northern coast. For more information, email ejler@mcn.org.



EJLER HJORTH-WESTH



TELAH RHODES

Cecil Rhodes spent two years building this 13' Paul Gartside-designed motor launch. The hull is built from three layers of cold-molded western red cedar on frames of white oak. The decking is also made from oak. Cecil launched BLACKFISH last August at Elk Lake near Victoria, British Columbia. Plans and finished boats are available from www.gartsideboats.com.

John Noon and Joe Taylor built this 30' 6" cedar-on-oak Crocker Gull in Gordon "Swift" Swift's barn in Kensington, New Hampshire. The pair had help from Marty White and David Pillsbury, with Swift, who died in February last year, participating as able. The team mentored owner Carrie Hollingsworth in the art of traditional wooden boat construction as well. Paul Rollins built the spars. The group launched CELERITY last fall in Kittery, Maine.



SARAH PUTNAM



ROB DAVIDSON

Allison Warner (www.adkwoodenboats.com) built this 16' traditional Adirondack Guide Boat as a demonstration at the Adirondack Museum in Blue Mountain Lake, New York. The planking is white pine, ribs and stems are red spruce, and accents are curly maple, all fastened with about 1,500 brass screws and 3,500 copper clench tacks. The museum auctioned the boat to raise funds for the boatbuilder-in-residence demonstration program. Plans are available at www.adkmuseum.org.

Karl Otto Gravdal of Sagvåg, Norway, wanted to build a boat so his many grandchildren could safely enjoy their home waters on Norway's west coast. He built BRIT BESTO, an 11'-long mini fishing boat; powered by an electric outboard motor, it has a top speed of 3 knots. A glass-bottomed fish tank in the middle of the boat lets the children watch for fish while underway.



THE GRAVDAL FAMILY



ROBIN CLIFFORD WOOD

LYDIA BAILEY is the title character in a novel by Maine author Kenneth Roberts. She is also the name of a 14' Lincolnville Salmon wherry, built by Bruce Brown (a grand-nephew of the author), his wife, Cathy, and friend Fred Kircheis. Over eight years the team built the wherry from Maine-grown cedar, white pine, cherry, white ash, apple, black spruce, and Connecticut-grown oak. Walter Simmons (www.duck-trap.com) designed her.

Steve Altman of Johnston, Iowa, built this 15' 5" long Snipe-class sloop with help from Paul Morris of Cedar Tree Boats. The hull is built from okoume plywood and mahogany. Steve writes that it was a one-year project that took 12 years. The Snipe class was designed in 1931 by William Crosby. Steve plans to sail AMANDREW at Big Creek State Park near his home.



JIDJIL ALTMAN

LAUNCHINGS

BOB BENNETT



Bob Bennett loves cruising on the southern shore of Cape Cod, Massachusetts, in his new Glen-L Marine Playpen runabout, BOB ABOUT II. The 15'5" launch is built of plywood on frames of Sitka spruce with mahogany trim, and powered by a 25-hp Yamaha outboard. Bob spent 16 months on the construction. Plans are available at www.glen-l.com.

Mike Pease of Kamloops, British Columbia, is very proud of his new Penobscot 14 sailing dinghy designed by Arch Davis (www.archdavis.com). The keel and stringers of the hull are spruce, as are the mast and spars. The planking is mahogany plywood, and the seats and rail cap are of oak stained to match the mahogany. Mike sails on Monty Lake near his home.



MIKE PEASE

DOUG FOWLOW, INSET: EAY MATTHEWS



EXOTIC DANCER is a Jericho Bay Lobster Skiff built by Doug Fallow of Kippens, Newfoundland. Doug extended the length of the hull to 16' and the beam to 5'5". Her strip-planked hull is built from Newfoundland juniper (larch). Her oak seats were made from salvaged church pews. See WB Nos. 210 and 211 for more information. Plans are available from www.woodenboatstore.com.

Douglas Brooks (www.douglasbrooksboatbuilding.com) taught a one-month Winter Term at Middlebury College in Vermont, introducing 15 students to Japanese boatbuilding. The class built two boats in the traditional manner from white cedar and pine. They built a 19'3" boat from the Kesen River region and a 15'-long design from the Hozu River area. The class conducted a traditional Shinto launching ceremony in the college pool.



DOUGLAS BROOKS

SUSAN BURRESON, INSET: GENE BURRESON



Gene Bureson's three grandchildren got a wonderful surprise last Thanksgiving when they visited their grandparents in Gloucester, Virginia. Grandpa Gene had built them a 12' Wee Rob canoe so they could explore the wandering tributaries of the Chesapeake near his home. Gene built the hull from marine plywood, with redwood and cherry trim. Plans for the Iain Oughtred design are available from www.woodenboatstore.com.

In 1963, Rudy Haase designed and built this 10' × 4' trimaran SCREECHIE so his eight-year-old son Bruce could row around the harbor. SCREECHIE stayed in the family and eventually came to live in the barn after Bruce grew up and left home. Bruce recently restored her and noticed she'd gotten smaller since the last time he took her out for a row.



TASHA HAASE



EDWIN WILLIAM DE COSSY

Bill de Cossy built this Catspaw dinghy, DULAMAN, in Ireland more than 25 years ago. He's since moved to Connecticut and brought her with him. Recently DULAMAN needed some restoration as the seams split open with age. Bill sheathed the leaking hull in fiberglass and installed a deck, an electric motor, and a canopy. He cruises in style on Linsley Pond in North Branford, Connecticut.

SURCEASE is a 1950s, 19'10" Flying Dutchman class cold-molded sloop that Douglas Heckrotte spent his summer evenings over 11 years restoring. He made extensive repairs, gluing new veneer to the exterior of the hull, adding stringers, and replacing fastenings, stem, frames, and deck. SURCEASE lives on a trailer when she is not sailing out of Rock Hall, Maryland.



SUSAN HECKROTTE



KYLE ABINGTON

Kyle Abington and Maris Skabardis have been busy at their boatshop in Faversham, Kent, England. They recently relaunched this 1948 Halcyon-class mahogany-on-oak sailing dinghy. They replaced many of the frames, repaired the transom, and replaced the side decks with plywood before refinishing the 15' gunter-rigged sloop. Find out more about Abington & Skabardis at www.marinecarpentry.co.uk.

Hints for taking good photos of your boat:

1. Set your camera for high-resolution images. We prefer jpg format, at 300 dpi minimum.
2. Stow fenders and extraneous gear out of the camera's view. Ensure the deck is clean and uncluttered.
3. Take your photographs in low-angle sunlight for best results. Early morning or late afternoon usually work well.
4. Keep the horizon level and the background simple and scenic so your boat stands out from its surroundings.

5. Take some pictures of the boat underway and some at rest. Vertical format often works well for sailboats. Shoot lots of images, send us your five favorites.

We enjoy learning of your work—it affirms the vitality of the wooden boat community. We receive so many submissions that there is not room in the magazine for all of them to be published. Launchings not printed in the magazine can be seen at www.woodenboat.com/boat-launchings. 

WoodenBoat REVIEW

PRODUCTS • BOOKS • VIDEOS • STUFF

ATLANTIS Stories: Before the Mast on a Sailing Research Vessel

Reviewed by Elliot Rappaport

ATLANTIS Stories: Before the Mast on a Sailing Research Vessel, by William D. Cooper. Woods Hole Historical Museum, 579 Woods Hole Rd., Woods Hole, MA 02543. 294 pp, \$39.95.

In 1944, William Cooper, aged 17, joined the crew of the Sailing Research Vessel ATLANTIS, of the Woods Hole Oceanographic Institution (WHOI). ATLANTIS was a 143' marconi-rigged ketch, of riveted steel, designed by MIT naval architect George Owen and built in 1931 at the Burmeister & Wain shipyard of Copenhagen. She was the largest ketch in the world. With 7,000 sq ft of sail, a 17' draft, and a 147' mainmast, she had more in common with the grand racing yachts of the prewar era than anyone's idea of a modern research ship.

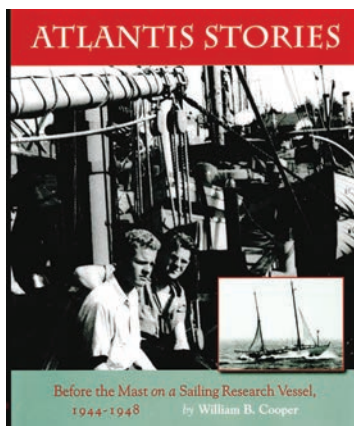
For anyone familiar with the WHOI of today, financed with defense dollars and operating a large, sophisticated fleet, it might be hard to imagine its simpler origins as a sort of yacht club for Harvard scientists, grown out of a summer colony on the south shore of Cape Cod. There, in the prewar years, Harvard biologist Dr. Henry Bigelow, with some other pioneers of the nascent science of oceanography, laid the foundations for today's research giant with seed money from a Rockefeller Foundation endowment.

Bigelow's chief assistant, and eventual successor, was a graduate student named Columbus Iselin II. Scion of a prominent New York banking family, Iselin fit the classic profile of a young

gentleman explorer. (His uncle Oliver had defended the AMERICA's Cup.) During his senior year at Harvard, Iselin commissioned his own 78' schooner, CHANCE, built and fitted out for oceanographic research, and he and several classmates spent the next few summers at sea, gathering data on the Gulf Stream and Labrador Current.

With this background in mind, it becomes easier to fathom the young institution's choice for its first ship. The new vessel, if not fast by steamship standards, had great range and seakeeping ability, and would sail 750,000 miles for WHOI before her retirement in 1964. Her career effectively straddled the transition of oceanography from an obscure scientific sub-discipline to a discrete and strategic field, propelled by heavy injections of federal money. ATLANTIS lives on in silhouette as the centerpiece of the WHOI logo, and as the namesake of the institution's contemporary flagship vessel.

Bill Cooper's personal story may be familiar to many, in that it involves the life of a young person drawn in irrevocably by the lure of the New England waterfront. He recounts his early experiences as "boy" aboard a new yacht fitting out in Thomaston, Maine, and soon thereafter as a seaman in ATLANTIS during the latter years of World War II. This was an interesting time, and a transitional one. With the war effort in full swing, most of the men aboard were either very young, or quite senior, and Cooper found himself learning the craft of deepwater sail from some of its last true professionals—men in their 60s, many Scandinavian, who had



practiced their trade in the last commercial square-riggers and aboard the largest of racing yachts. The crew lived in the fo'c's'le, and the officers aft. There was little casual interaction. It was a salty world, and not particularly nurturing: "Squarehead sailors," writes Cooper, "rarely if ever complimented anyone. They expected that everything would be done well at all times. 'You call yourself a seaman, don't you?'"

From this vantage, we view the small details of life aboard ship, and read of the larger events that anchor the narrative to history: the U-boat war; how to rig a sailor's clothesline; the death of FDR; how to mix a "soogee" bucket. In the background, scientists lay the groundwork for modern physical oceanography, with an increasingly sophisticated array of equipment and ideas. To accompany Cooper's recollections, there are sidebars by the editors, adding information about the ship, her crew and work, and the historical backdrop through which she sailed.

Told in a direct style with little reflection, the accounts have a powerful ability to transport the reader to the scene, and capture the signature mixture of tedium and fascination that is the heart of life at sea. For anyone who wonders what it was like to stand watch

in the days before electronics, or to work with real Cape Horn sailors, this book makes for a compelling read. Cooper himself went on to a career in wooden boat construction, and his appreciation of the trade is evident in his descriptions of shipbuilding in mid-century New England, and of the numerous small craft that shared ATLANTIS's mission: wooden minesweepers, Beetle whaleboats, catboats, and the Greek felucca that the captain simply had to buy and bring home.

This is an intensely local story, recorded and published by friends of a person who had memories worth preserving. It is likely to resonate the most with those of us who have spent time in some of the same places, and have been drawn along by the same impulses that Cooper felt in his own life. That said, well-written accounts of everyday fo'c's'le life are comparatively rare, and I would recommend this one to anyone who is interested in what it felt like to simply wake up and go to work on a vessel such as ATLANTIS.

Elliot Rappaport is a research vessel captain and instructor with the Sea Education Association in Woods Hole, Massachusetts. He was formerly captain of the Maine Maritime Academy schooner BOWDOIN, which he commanded on voyages to Greenland and Labrador.

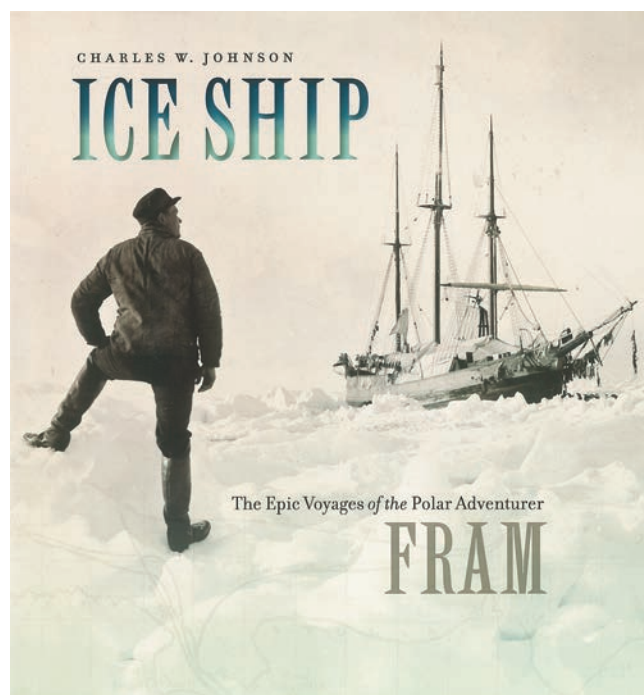
Ice Ship: The Epic Voyages of the Polar Adventurer FRAM

Ice Ship: The Epic Voyages of the Polar Adventurer FRAM, by Charles W. Johnson. ForeEdge, an imprint of University Press of New England, www.upne.com. 318 pp. \$35 hardcover; \$29.99 e-book.

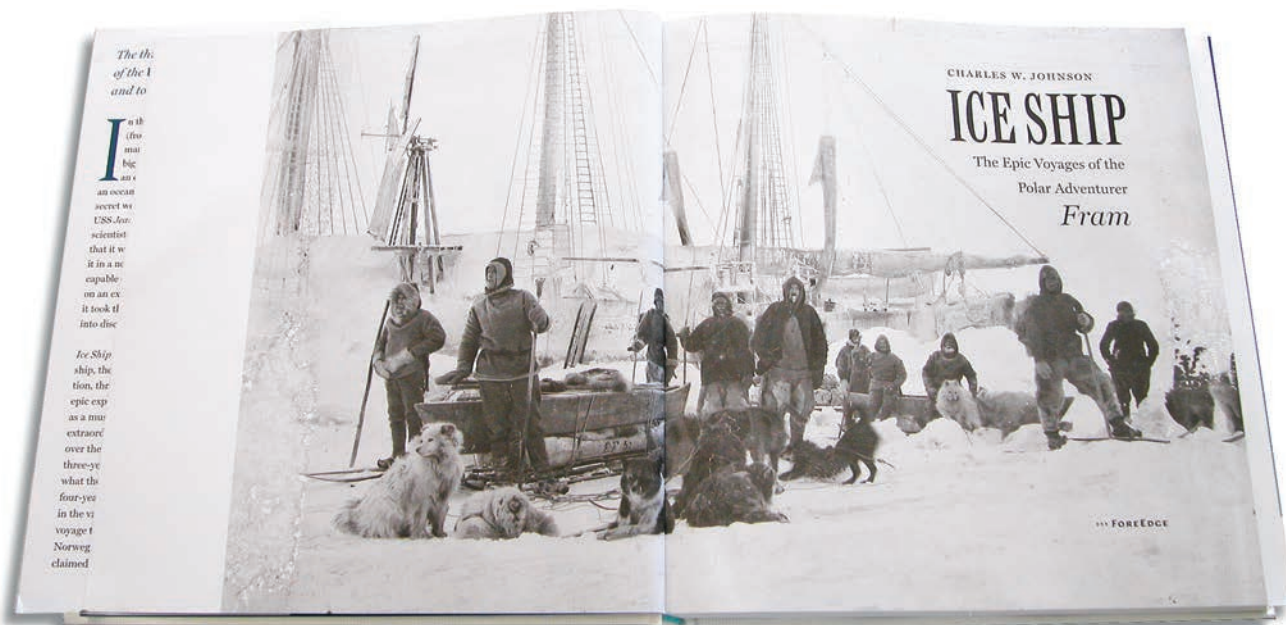
Reviewed by Matthew P. Murphy

The western world of the late 1800s and early 1900s was gripped by the mania of Polar Fever—the equivalent of the 1950s and '60s Space Race. As with lunar exploration, the reward of exploring the polar regions was, ostensibly, the advancement of scientific knowledge; also at stake were no small measures of personal fame, prestige, and national pride.

In June 1879, an expedition aboard JEANNETTE, a British-built, American-owned bark, came to grief in



an attempt on the North Pole. The ship was frozen-in near Wrangel Island, northwest of the Bering Strait, and for the next 18 months drifted 1,000 miles in a northwesterly direction before finally being crushed by the tectonic pressure of pack ice. The crew abandoned the wreckage, with only a fraction of them surviving the ensuing ordeal. The ship's remains, presumed lost forever, were found many months later 3,000 miles from the vessel's last known position.



Fridtjof Nansen (second from left) and Hjalmar Johansen (fourth from right) depart the frozen-in ice ship FRAM for their over-ice attempt to reach the North Pole, March 14, 1895.

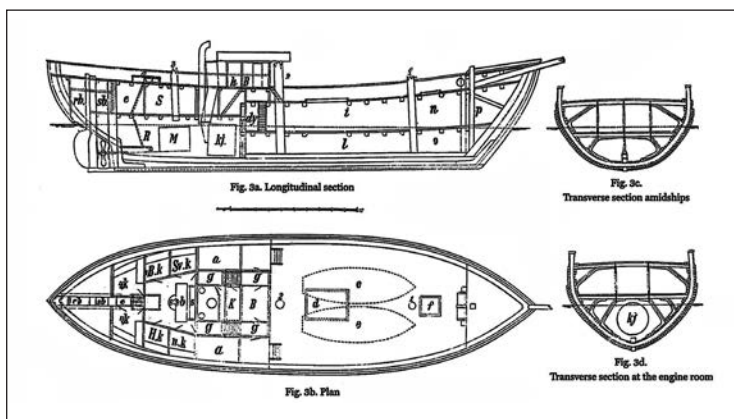
In Norway, a young, Polar-fever-struck explorer named Fridtjof Nansen took a special interest in the track of JEANNETTE's bones. Already a national hero in Norway for having trekked across Greenland, Nansen hypothesized that the drifting wreckage illuminated a heretofore unknown polar current flowing across the top of Greenland from Siberia to the North American coast. So confident was he in this theory that he tested it by designing and building a ship for a slow, deliberately frozen-in voyage at the mercy of the ice. He called the ship FRAM—"forward" in Norwegian. *Ice Ship*, by Charles Johnson, is a new biography of that ship.

Nansen selected Colin Archer, the legendary Scottish-born builder of bombproof pilot boats and rescue boats in Norway, to design and build FRAM. There were no existing models on which to base the design, and very little knowledge of the milieu in which she'd operate, except that it would be cold, and that the icebound ship would be more base camp than vessel—more space station than rocket, if we're to continue the extraterrestrial analogy. Indeed, one of the fundamental precepts of the design—and of Nansen's exploration philosophy—was that the new vessel would not be meant to overpower the harsh Arctic conditions. Rather, FRAM and her crew would work

in harmony with nature, in effect becoming a piece of the icescape in which she drifted.

Like the ship herself, Johnson covers a lot of ground in *Ice Ship*. He describes FRAM's three major expeditions—two to the Arctic and the final one to the Antarctic—under three separate commands. The first voyage, begun by Nansen and concluded by his next-in-command, lasted for three years. One convenience of being frozen into solid ice is that it expands the ambulatory range of a ship's crew: There's little, save for polar bears, keeping you from stepping over the side and taking a walk. The itchy-footed Nansen did not sit idly by when he realized the North Pole was not within the ship's reach. Rather, he and shipmate Hjalmar Johansen, in a carefully planned expedition within an expedition, set off by dogsled toward the pole. He turned the command of FRAM over to Otto Sverdrup. For all of his

FRAM's design and massive construction were accomplished by Colin Archer, on whose rescue and pilot boats the ice ship was modeled.



risky exploring, however, Nansen did not take chances. He was a careful and calculating leader, and as such abandoned this polar quest after a level-headed assessment of its odds, and began an arduous over-ice homeward journey that included eight winter months in a tiny cabin on Franz Josef Land. There he and Johansen endured the Arctic night and then hitched a ride the following spring with a British expedition, back to Norway and immortality. Incredibly, FRAM arrived home only six days behind Nansen and Johansen.

Sverdrup, now a veteran commander of FRAM, took her on an Arctic expedition of his own two years later. And eight years after the return of that expedition, in 1910, Roald Amundsen announced his intention to take FRAM north once again—though his announced route would initially go south, carrying him around Cape Horn and on through the Bering Sea for a drift through the Northwest Passage. That's not how it went: His actual route, intended all along but not revealed until well into the voyage, was a journey to the South Pole. Why the secrecy? Because the prestige of being first was at stake, and British explorer Robert Falcon Scott was already en route to Antarctica in his TERRA NOVA. Unbeknownst to Scott until it was too late, the Amundsen expedition was nipping at his heels, and would ultimately beat him to the pole by just several weeks. Author Johnson's description of the Scott party's demise after its second-place arrival at the pole is lyrical and heartbreaking.

The Antarctic geography is fairly easy to hold in one's head, for FRAM and TERRA NOVA arrived at different points on the Great Ice Barrier—now called the Ross Ice Shelf—and made beeline journeys to the pole, like spokes on a wheel. The Arctic expeditions,

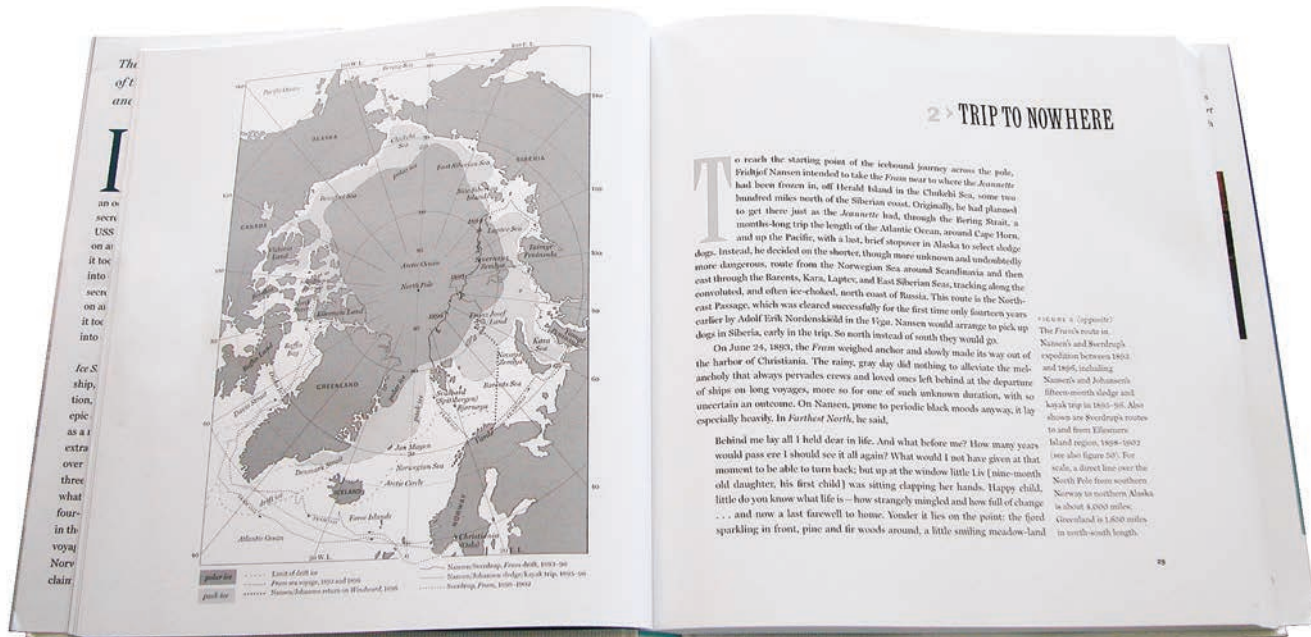
wandering as they did among pesky landmasses, were more labyrinthine: In descriptions of the Arctic, the world as we know it is, literally, turned on end. Viewing the globe from the top, familiar and far-flung continents converge. For North Pole newcomers, a careful study of the reference chart provided at the beginning of chapter two will yield a satisfying read of these Arctic narratives.

Ice Ship also succeeds in describing the mental fortitude required of the Arctic pioneers. Consider the questions facing Otto Sverdrup and crew at the onset of winter:

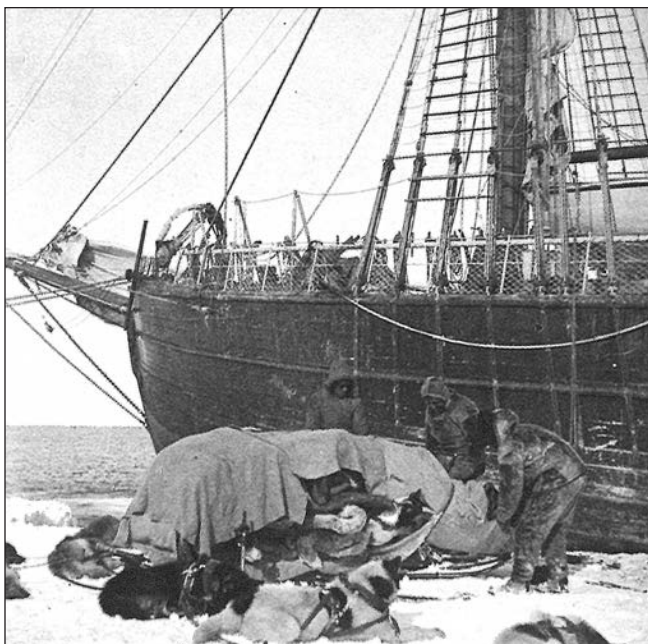
What if they could not get through or around the end of Jones Sound? What if the way north were impassible? What if they could not find enough game to keep them going or restock the FRAM for next winter? What if the weather or the ice made travel impossible? What if, without a doctor [theirs had tragically died] to diagnose illnesses, they lost more men from the already-reduced force? What if the dogs died in an epidemic, as had Robert Peary's? What if the ice did not relent and free the FRAM from winter harbor this year, or the next, or ever?

Such uncertainty was the reality of pushing the limits of polar understanding.

Beyond the geography and derring-do, there is also plenty in this biography to satisfy the boat-minded among us. Johnson offers a detailed description of FRAM's structure, which included four layers of planking and a 3" layer of greenheart ice sheathing, for a whopping total hull thickness of 3'. Two watertight bulkheads guarded against ice damage and collision.



The view from above: The Arctic is a sea surrounded by continents, while the Antarctic (not shown) is a continent surrounded by seas.

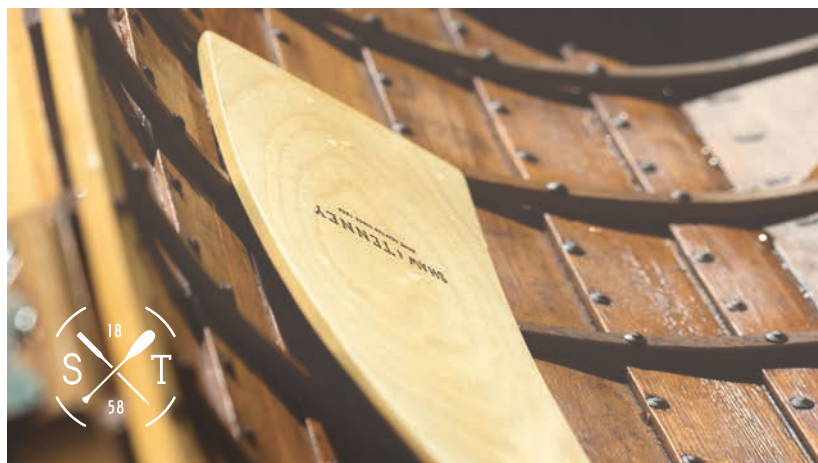


Provision was made to unship and stow the rudder before the vessel became icebound and also to dismantle the engine and lubricate its parts for stowage.

FRAM at the edge of the Great Ice Barrier (now called the Ross Ice Shelf), Antarctica, January 15, 1911. Supplies are being loaded for the expedition to the South Pole.

Ice Ship is beautifully illustrated and produced, and wonderfully researched; it's a remarkable account of a remarkable ship. Like FRAM—like all science—it answers many questions while begetting many more. To wit: I'd like to know more about the ill-fated JEAN-NETTE expedition, which was funded by the colorful publisher-showman James Gordon Bennett, Jr. (To that end, I'll read Hampton Sides's 2014 account of that expedition, *In the Kingdom of Ice*.) I'd like to learn more of the secretive Amundsen (*The Last Viking*, published in 2012, is a promising biography). And I'd like to know more about the conservation measures and philosophies applied to FRAM when she was entombed in a simple, monolithic A-frame building on Norway's Bygdøy peninsula, opposite the Oslo waterfront. I've visited her there on several occasions over the past few decades, and am eager to return. My next visit will be a more profound one thanks to *Ice Ship*.

Matthew P. Murphy is editor of WoodenBoat.



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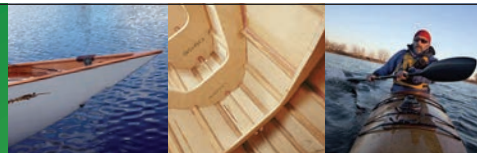
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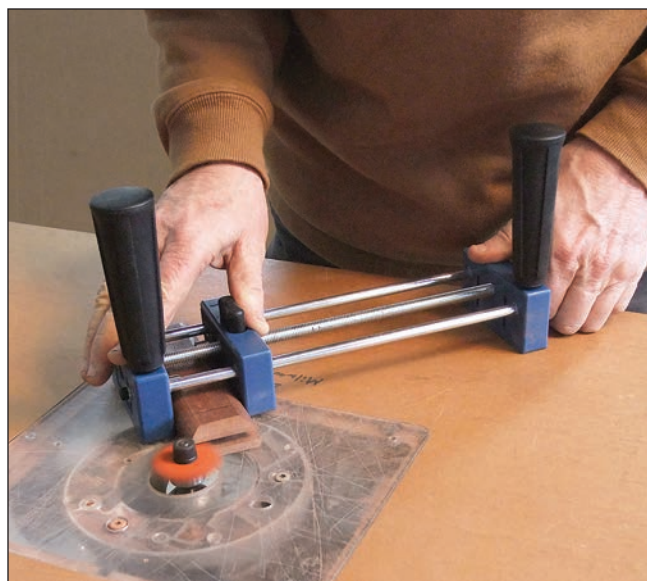
JOUBERT
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Rockler Small Piece Holder

Reviewed by John Brooks

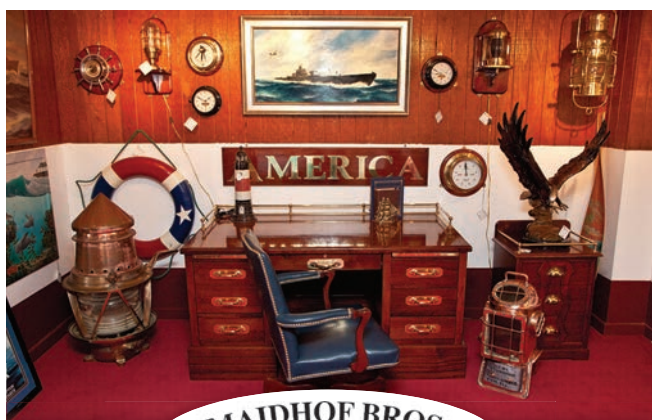
When you push a piece of wood against a router bit rotating at 15,000 rpm or so, there is plenty of force trying to tear it out of your hands and send it explosively across the room, usually accompanied by a loud bang and followed—only slightly more quietly—by the pounding of one's heart. Hand-holding of reasonably large and long pieces is a perfectly fine technique, but it is difficult or impossible to maintain a solid grip on small pieces with your fingers alone, fingers that also need to be kept safely away from the bit.

The Rockler Small Piece Holder aims to solve this



RUTH ANN HILL

The Rockler Small Piece Holder is designed for the safe table-routing of workpieces too small for hand-holding. The author found the tool to be well made and effective, but the handles too high for holding the workpiece firmly against the router table; he thus resorted to gripping the jig's main body, as seen here.



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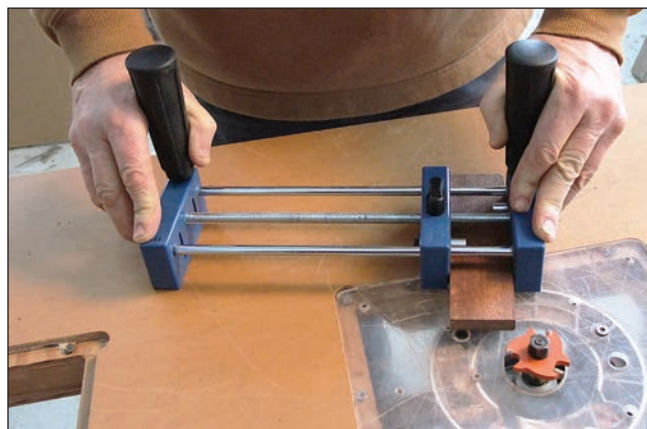
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Pieces greater than 1" in thickness are held down by the tool's rails. Thinner pieces, as seen here, are gripped by threaded pins turned through the clamp body.

problem. Out of the box, it appears well-made and feels reassuringly sturdy. I was pleased to see that the tool doesn't twist or flex. All actions are smooth and solid.

A piece of wood being cut by a router bit wants to move in the horizontal plane and also upward. For accurate and safe cuts, all of this extracurricular movement must be stopped. Horizontal movement is addressed by the jig's sliding clamp, which moves easily on the rails when the locking clutch is released and tightens quickly and well. The jaws' business faces have a sandpaper surface to prevent sliding. As for upward movement, parts thicker than 1" are held down by the cross rails. Two small adjustable pins are provided for restraining thinner pieces. These pins work well when sufficiently tight, but locking them in place requires holding each pin with pliers while tightening its Allen screw. Vibration was minimal while cutting with high-quality, sharp CMT bits and nothing moved. Router bits that cause more vibration would warrant extra checks against loosening.

The handles proved too high for me to hold the jig



RUTH ANN HILL

and workpiece down firmly against the router table. Instead, I held onto the main body of the jig, hooking a finger or thumb around the bases of the handles.

The Small Piece Holder works well at its specific intended task. I was able to rout all four sides of a mahogany block that measured $\frac{3}{4}'' \times 2'' \times 6\frac{1}{2}''$. For parts thicker than 1", fastening a block of the same thickness as the part at the non-clamping end kept the holder riding level on the router table.

This holder clearly is not meant for angled, irregular, or curved parts (at least not the portion clamped in

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the tool) and the manufacturer plainly states this in the instructions. Certainly for smaller boats, and in many places in larger ones, this would make us wonder when we could use it, since all the small parts needed have curves or angles—or both. I could see myself reaching for it to make joints for small doors with short stiles and rails. I also might rout small blocks for various mounting pads, or perhaps some turn knobs for floorboards and lockers.

For most boat-related jobs I would have to turn to other approaches to shaping smaller parts—approaches such as creating a shop-made jig that can hold an irregular piece securely; routing long stock first then cutting it into small pieces; or fastening the piece in place on the boat, and then routing it. Still, the Small Piece Holder is a thoughtfully designed, quality tool that would have occasional moments of utility in the boatshop, and be otherwise handy for projects around the house. Used properly, it should do the job easily, safely, and well.

For more information, visit www.rockler.com.

John Brooks is a boat designer and builder (www.brooksboatsdesigns.com), a regular contributor to WoodenBoat, and an instructor at WoodenBoat School.

BOOKS RECEIVED

The WESTERN FLYER, by Kevin M. Bailey. Published by The University of Chicago Press, 1427 East 60th St., Chicago, IL 60637, www.press.uchicago.edu. 146 pp., hardcover, \$22.50. ISBN: 978-0-226-11676-1. *John Steinbeck and his friend Ed Ricketts chartered the sardine seiner WESTERN FLYER in 1940. He wrote about that boat in The Log from the Sea of Cortez. Author Kevin Bailey has tracked down WESTERN FLYER and recorded her history since that charter.*

**Albert Strange: Yacht Designer and Artist*, by John Leather. Foreword by Iain Oughtred. Published by Lodestar Books, 71 Boveney Rd., London, SE23 3NL, U.K., www.lodestarbooks.com. 224 pp., softcover, \$30. ISBN: 978-1-907206-32-0. *Plans, historic photographs, and drawings augment the text, giving the reader a fine understanding of Strange's talent and designs; first published in 1990 by The Pentland Press Ltd on behalf of The Albert Strange Association.*

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Gunks & Goos: Mixtures for Protecting Ropes, Boats, Nets & Sails, by Rick Mitchell. Monograph No. 14 by the Museum of Knots and Sailor's Ropework. Published by Footrope Knots, 501 Wherstead Rd., Ipswich, IP2 8LL, U.K.; www.despawson.com. 84 pp., softcover, £7.50. *Recipes for tanning and dressing sails, blacking metal, tanning nets, Stockholm spar tar, among others.*

Wreck of the Whale Ship ESSEX: The Extraordinary and Distressing Memoir That Inspired Herman Melville's Moby-Dick, by Owen Chase. Published by Zenith Press, 400 First Ave. N., Suite 400, Minneapolis, MN 55401, www.zenithpress.com. 224 pp., hardcover, \$35.00. ISBN: 978-0-7603-4812-3. *Photographs of sperm whales, whaling artifacts, paintings, passages from Moby-Dick, and accounts from other mariners augment an unforgettable true story.*

Leaving for the Seal Hunt: The Life of a Swiler, by John Gillett. Published by Flanker Press, P.O. Box 2522, Station C, St. John's, NL, A1C 6K1, Canada, www.flankerpress.com. 172 pp., softcover, \$18.95. ISBN: 978-1-77117-413-8. *An autobiographical memoir by a Newfoundlander who has spent his life fishing and sealing, working some of the most dangerous waters in the world.*

***Canoeecraft: An Illustrated Guide to Fine Woodstrip Construction**, by Ted Moores. New Expanded Edition. Published by Firefly Books Ltd., 50 Staples Ave., Unit 1, Richmond Hill, ON, L4B 0A7, Canada www.fireflybooks.com. 206 pp., softcover, \$24.95. ISBN: 978-1-55209-342-9. *A reprint by canoe maestro Ted Moores with color photographs and testimonials by canoe builders and owners.*

ROWDY, by Christopher Madsen. Published by the author, CPM Publishing, 3 Willowglen Place, Santa Barbara, CA 93105, rowdystory@yahoo.com. 480 pp., hardcover, \$55.00. ISBN: 978-0-9960260-0-0. *After the author bought ROWDY, a derelict 1916 New York 40, he began investigating her history and original owner, Holland Sackett Duell. Madsen records Duell's rich life story as a World War I officer, patent attorney, New York state senator, and sailor.*

***Canoe Paddles: A Complete Guide to Making Your Own**, by Graham Warren and David Gidmark. Updated and Expanded. Published by Firefly Books Ltd., 50 Staples Ave., Unit 1, Richmond Hill, ON, L4B 0A7, Canada, www.fireflybooks.com. 159 pp., softcover, \$24.95. ISBN: 978-1-55209-525-6. *A reprint by these esteemed craftsmen that now includes 16 new pages of color photographs of elegant canoe paddles.*

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***Making Wood Tools: Traditional Woodworking Tools You Can make in Your Own Shop**, by John Wilson. Second Edition Published by Home Shop Book, 406 E. Broadway Hwy., Charlotte, MI 48813, www.shakerovalbox.com. 280 pp., hardcover, \$39.95; ebook, 14.95. ISBN: 0-9729947-4-2. *The first edition of this book was reviewed in WB No. 229. Instructions and drawings to guide the building of 17 tools, as well as a workbench, tool trays, sawhorses, vises, and more.*

Lee Shore Blues: Sex, Drugs, and Bluewater Sailing, by Peter M. Heiberg. Published by the author, Lee Shore Blues, 336 Avalon Dr., Gibsons, BC, V0N 1V8, Canada; leeshoreblues@yahoo.com. Available on Kobo, Kindle, or Print on Demand from amazon.com. 254 pp., softcover, \$19.95. ISBN: 978-0-9936922-0-8. *A memoir by a man who spent a great part of his life on the water, including much ocean voyaging aboard CARLOTTA, a Bristol Channel pilot cutter.*

Dead on the Wind, by Marlin Bree. Published by Marlor Press, 4304 Brigadoon Dr., Saint Paul, MN 55126; www.marlinbree.com. 240 pp., softcover, \$14.99. ISBN: 978-1-892147-31-8. *This nautical thriller begins in the Tasman Sea in the middle of a round-the-world sailing race and includes a cast of solo circumnavigators among the suspects, victims, and investigators.*

The Boatmaker, by John Benditt. Published by Tin House Books, 2617 Northwest Thurman St, Portland, OR 97210, www.tinhouse.com. 453 pp., softcover, \$15.95. ISBN: 978-1-935639-98-5. *A modern-day fable about a man who wakes up from a nearly lethal fever with the compulsion to build a boat and sail away from the small island where he has spent his entire life.*

The Gondola Maker, by Laura Morelli. Published by the author, www.lauramorelli.com. 344 pp., softcover, \$12.49. ISBN: 978-0-9893671-0-3. *A novel set in Venice in 1581 about a gondola builder who restores a forgotten boat built by his grandfather.*

Marblehead's First Harbor: The Rich History of a Small Fishing Port, by Hugh Peabody Bishop and Brenday Bishop Booma. Published by The History Press, 18 Percy St., Charleston, SC 29403, www.historypress.net. 300 pp, \$23.99. ISBN: 978-1-60949-497-1. *A history of the commercial fishermen and other workers of Little Harbor, Marblehead, Massachusetts.* 

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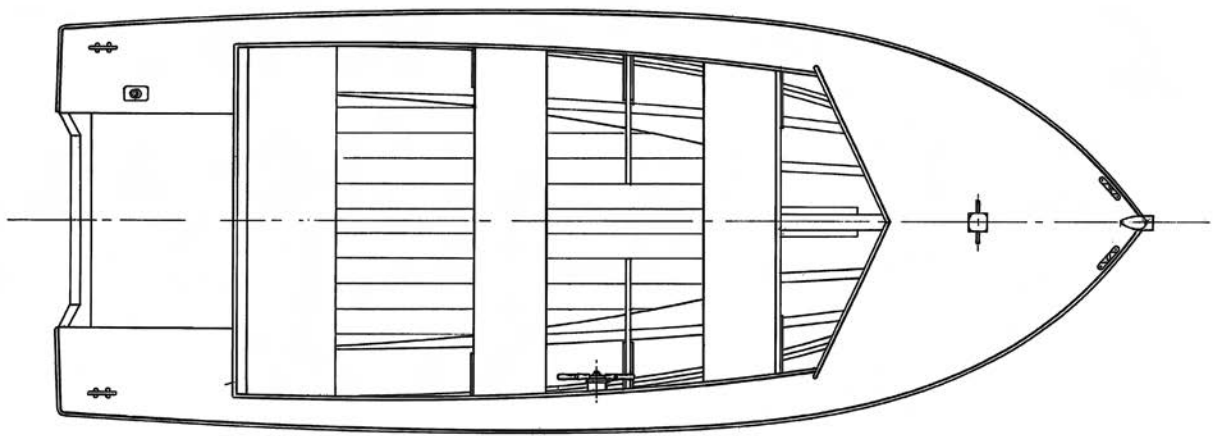
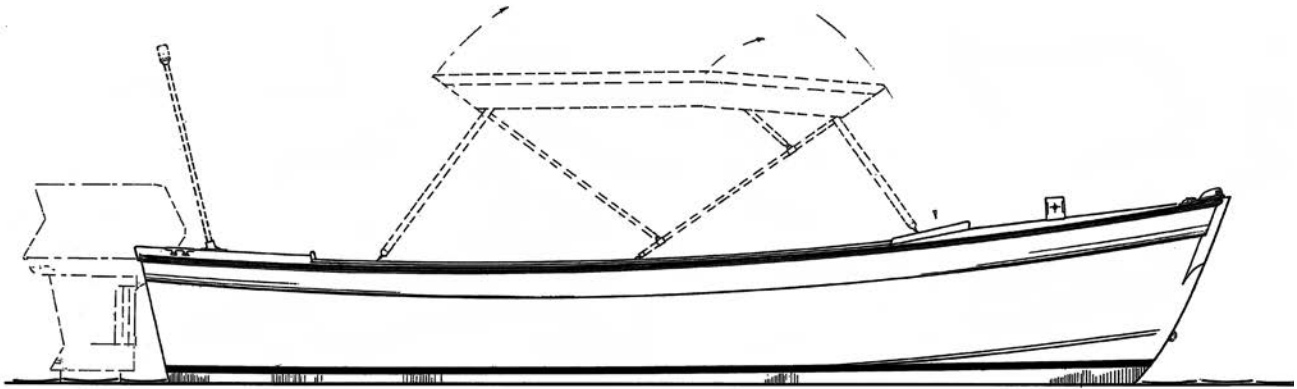


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Little Moby

Rough-water skiff

Design by Charles Wittholz

Commentary by Mike O'Brien

Here we have a handsome 14½' outboard skiff that combines simple plywood-on-frame construction with efficient and timeless hull lines. The revised Little Moby shown on these pages came near the end of designer Charles Wittholz's distinguished half-century career, and it seems

to have been one of his favorite designs. Although he had modified the hull lines through time, in the end he saw nothing more to change. Prospective builders might take comfort from a respected designer's final satisfaction with his own work.

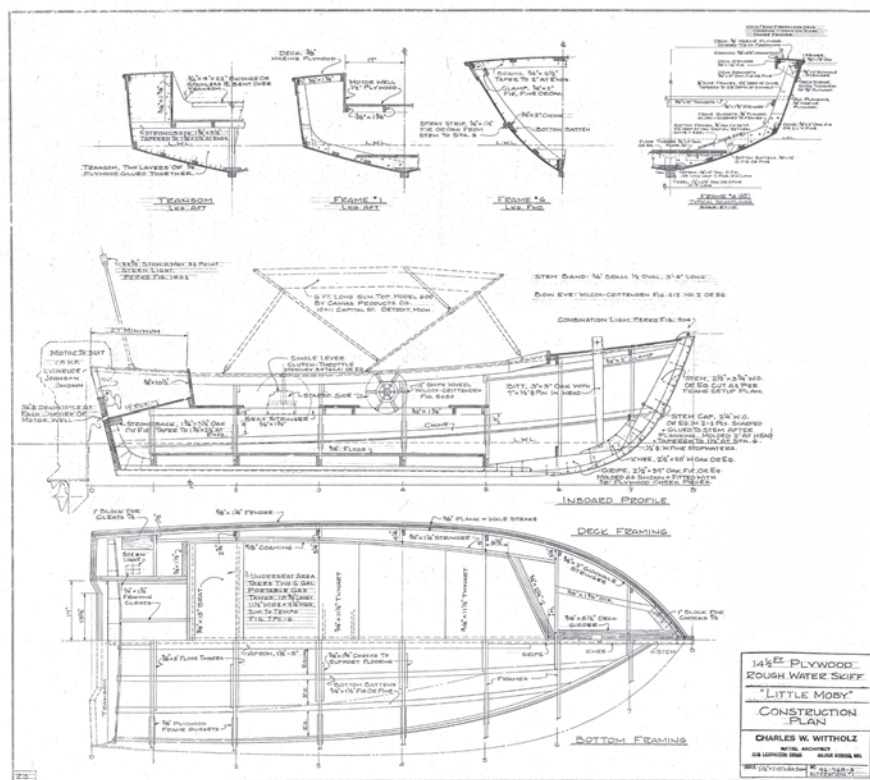
Wittholz referred to Little Moby as a "rough-water skiff." That

description seems appropriate when we look at the hull's ample freeboard, moderate deadrise, and rugged structure. The freeboard will help keep us dry and provide reserve stability. Despite those high sides, windage shouldn't be a problem here as the worst offenders—windshields, cabin trunks, masts,

Particulars

LOA	14'6"
Beam	5'5"
Draft	10"
Weight (hull)	475 lbs
Displacement	1,170 lbs
Power	10–40 hp

Above—Little Moby, a 14'6" skiff from the drawing board of Charles Wittholz, combines an efficient and good-looking hull with easy construction.



Unlike many of today's plywood hulls that go together in the stitch-and-glue fashion, Little Moby employs frames, chines, and stringers. The result is a rigid and long-wearing hull.

provide mute testimony to past battles.

Moby's fully framed plywood hull has rigidity to spare. Much of the internal structure could be eliminated if we were to stray from traditional construction and build the hull in stitch-and-glue fashion. The latter technique seems to trade a cleaner hull interior for a dirtier shop. Certainly a stitch-and-glue boat can go together very quickly—at least until we have to grind and sand. In any case, when properly accomplished, both methods provide more than sufficient strength.

As drawn, Moby's plans specify only the traditional construction.

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After completing this revised Little Moby design, Wittholz wrote to us saying, "The world seems to be turning to stitch-and-glue..." His letter indicated neither approval nor disapproval. Whether he, too, eventually would have dispensed with chine logs in favor of epoxy fillets was left unsaid. We should have asked.

Little Moby's designer possessed impressive credentials: the University of Michigan, MIT, John G. Alden and Company, and Philip Rhodes's office. Wittholz was a draftsman of the old school and always made certain to include precise detail in his drawings. On these plans he specifies the particular supplier for almost every piece of hardware and goes on to list the catalog numbers. No guesswork here! Builders might not agree with each specific on every drawing, but at least there will be no doubt as to the designer's intent.

The plans specify that we

assemble Moby's hull inverted on six transverse frames made from $\frac{3}{4}$ "-thick oak joined at the chines by $\frac{3}{8}$ " plywood gussets...simple to make and very strong. Wittholz tells us to sheathe the hull sides and bottom with $\frac{3}{8}$ " "marine plywood." Let's go for the best sheets we can find. This would prove a bad place to economize.

Although Moby's hull is made of inherently buoyant wood, the little skiff will carry an engine and other heavier-than-water gear. Let's add sufficient foam flotation placed so as to keep our skiff fully afloat and upright if the worst should happen.

Moby's layout speaks of tradition: three thwarts and a side-mounted steering wheel. This wheel orientation, although fine for low speeds, might supply cause for concern here. The arrangement doesn't lend itself to hand-over-hand wheel spinning, which sometimes can be desirable for tight maneuvering and in emergency situations. Perhaps a

small console hung from Frame No. 4 would permit the more familiar athwartships mounting without stealing too much space. As may be, if you should see this writer tooling around the cove at 25 knots while clutching the king spoke of a side-mounted Wilcox-Crittenden steering wheel, be afraid.

From Moby's crisply sculpted stemhead and mooring bitt, back along the sweeping sheerline to the afterdeck and splash well, Charlie Wittholz made a fine job of combining traditional appearance with contemporary performance. This good little skiff should be worth building for many decades to come. Functional simplicity tends to age well. 

Mike O'Brien is boat design editor for WoodenBoat.

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EUREKA

An adventure trimaran for racing and cruising

by Laurie McGowan and Michael Schacht

Dear Laurie and Michael,
I have had this design in my mind for quite some time. I have christened it Storm Master. It can be best described as a one-person, coastal-cruising, enclosed-cockpit sailing trimaran. Think of a small trimaran fashioned after a WWII fighter airplane. It would have a tall, fully battened mainsail and a self-tacking jib with all sheets led back to the cockpit. It would also have pedal-based rudders with kick-up ability for beaching. The hulls would be sectioned with watertight bulkheads for flotation. The craft would have a hatch forward in the main hull, where the single occupant would sleep. The boat's primary purpose would be for coastal camp-cruising and serious ocean sailing. It would be light enough to be sailed onto the beach and relaunched by one person, but ruggedly built for near-storm conditions. Overall length and width would be dictated by stability and weight considerations as well as its ability to transport minimal food and water. It would have no motor unless fitted with a built-in trolling motor for emergency use. The motor would be powered by a small lawn tractor battery or two—which could also provide power for a bilge pump.

I could see a boat such as this being broken down and shipped anywhere in the world to explore distant and exotic places, and I hope you can envision such a sporty little creation. I even think there may be a market for such a boat to cater to young adventurers desiring to explore on a shoestring. I only regret that it is about 40 years too late for me.

Sincerely,
George Erneston

Hi, George:

Thanks for the letter! Both of us have a longstanding interest in small multihulls, so your proposal is really intriguing. In a case of serendipity, the Northwest Maritime Center's inaugural Race to Alaska (R2AK), from Port Townsend, Washington, to Ketchikan, Alaska, is scheduled for this summer (it started June 4, 2015). It is a long-distance race through coastal waters for boats powered only by sail or human power (no engines are allowed), and in a bit of a eureka! moment, we realized that your Storm Master could be the basis for an ideal R2AK racer. So, we're combining your requirements with those of an R2AK boat, and hope they overlap in a good way.

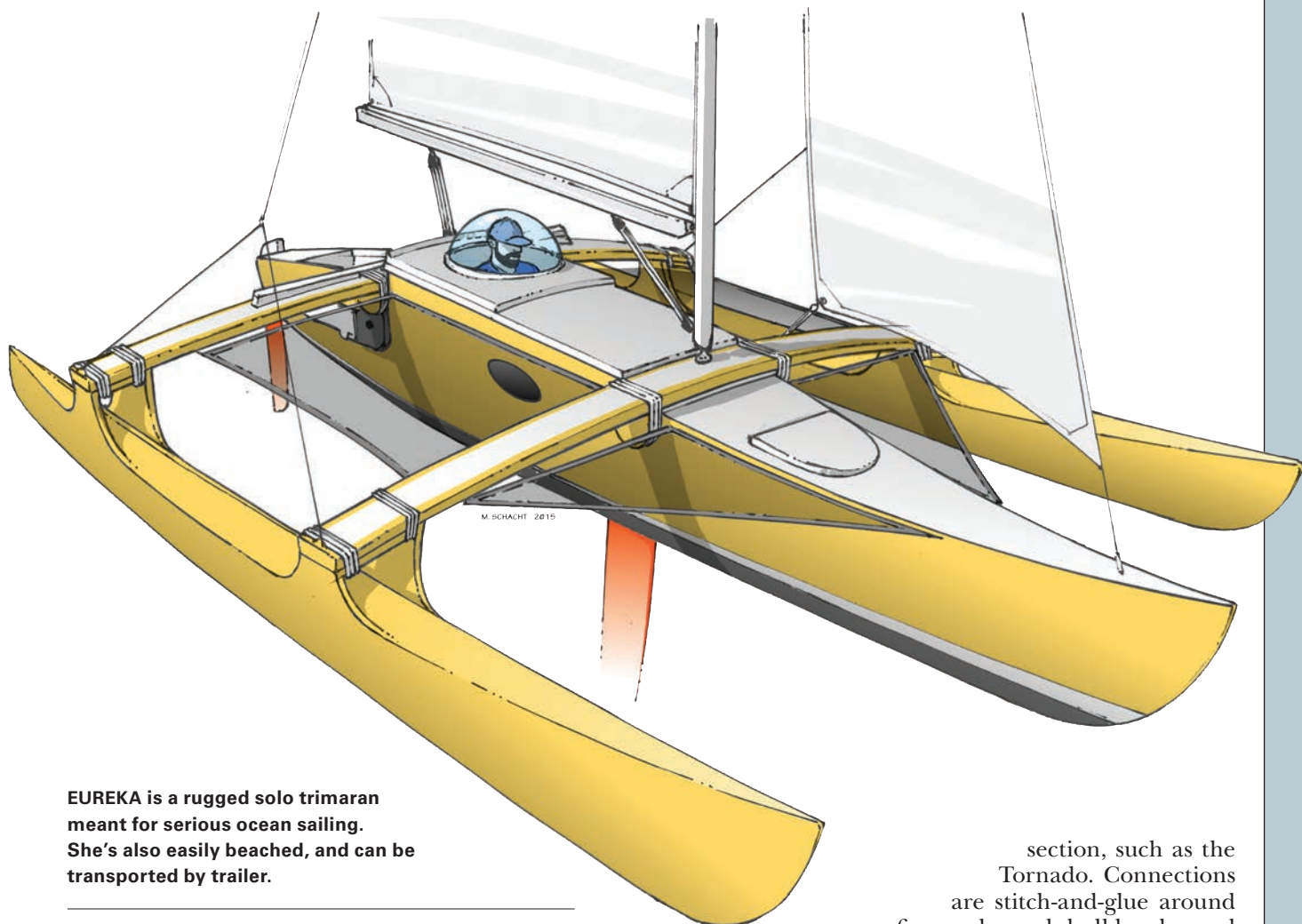
This little boat is strongly influenced by the work of the great Richard C. Newick, whose gull-like multihulls grace waters the world over. He loved simplicity and designs that were not, as he said, "too greedy." That is, he preferred a safer, more predictable sailboat to one sailed on the edge of capsize. He wanted his boats to make it back home.

EUREKA is a 20' (6.1m) demountable ("take-apartable") trimaran suitable for long-distance coastal cruising and adventure racing for one or two. Empty weight is approximately 500 lbs (230 kg), with a payload of up to 600 lbs (270 kg). We have drawn the boat with an aft "pedaling" cockpit, and a small cabin centered between the akas (crossbeams). Both have steering stations: the first with joggle sticks (or vertical tillers connected to tiller lines or rods) and the latter with foot pedals—kayak style, with one pedal on each side of the centerboard

trunk. The single berth flat sits directly above the trunk and runs forward, under the foredeck. We've drawn a kick-up centerboard and rudder to reduce the chance of damage in the event of grounding or hitting a submerged object, especially at speed.

Access to the cabin is through a sliding hatch with a plexiglass bubble canopy. The bubble allows sitting headroom inside the cabin with the hatch closed, and also reminds us of an OSTAR racer from the '70s or '80s. While there would be warm and dry steering within the cabin, we think that the exterior cockpit as drawn offers excellent visibility and access to the control lines, and if you're wearing modern high-performance foulweather gear, it could even be comfortable. The loo, a simple bucket, is stowed aft of the cockpit, under the after deck. The cockpit is self-draining through flappered scuppers in the transom.

The conditions for the race are, in a word, unpredictable—just as is serious cruising. It could be flat calm; there might be a gale; it could be raining, foggy, snowing, or brilliantly clear; and most likely it will be a mix of all of the above. Add in powerful tidal currents, plenty of rocks, and barely submerged deadheads to make the race a challenge for both sailor and designer. Also, there will be bears. Among the current entrants there are cruising yachts and racing multihulls, rowboats, a curragh, and even a standup paddleboard, but we think that a truly multipurpose, sail-and-human-powered vessel stands the best chance. The human-powered aspect dictates a light and long, low-resistance hull form, while



EUREKA is a rugged solo trimaran meant for serious ocean sailing. She's also easily beached, and can be transported by trailer.

the sailing aspect requires a hull with adequate sail-carrying power. These two conflicting requirements are elegantly solved with the double outrigger, or trimaran, configuration.

Construction

Trimarans are by their nature somewhat complex craft. We have attempted to minimize complexity, weight, and expense by using the minimum number of parts: one vaka (main hull), two amas (outrigger floats), and two akas, and have attached them in a simple way. The new boat does not have the typical trimaran's athwartship-overhanging cabin. All parts except the vaka are light enough for one person to handle, so that assembly may be accomplished by the solo sailor. The arched akas are made of hollow box-sectioned spruce and plywood, and are lashed to the hull and amas with high-strength braided line.

All three hulls are fabricated from 6mm developed or "tortured" plywood—the same construction technique used to build the International Tornado catamaran. EUREKA's sections are more like the "classic" Newick shapes, a rounded V, so bending the plywood will be easier than on boats with a more semicircular

section, such as the Tornado. Connections are stitch-and-glue around 6mm plywood bulkheads, and on centerlines. Further stiffening of the vaka is accomplished with the cockpit deck, the berth top, and a few frames. All exterior surfaces are sheathed in 6-oz fiberglass cloth and epoxy, with extra cloth on the keels.

The akas are lashed to the vaka and the amas in the way catamaran builder James Wharram rediscovered from ancient Polynesians: wrapping turns or loops of

EUREKA Particulars

LOA	20' (6.1m)
BOA	13'4" (4.06m)
Draft	9" to 4'10" (0.2–1.49 m)
Weight	500 lbs (230 kg)
Sailing displacement (half load)	800 lbs (363 kg)
Working sail area	220 sq ft (21 m ²)
Reaching spinnaker	180 sq ft (16.72 m ²)
Bruce Number*	1.64

*The Bruce number is the square root of sail area (in square feet) divided by the cube root of displacement (in pounds). It relates power to weight, so is a predictor of potential speed.

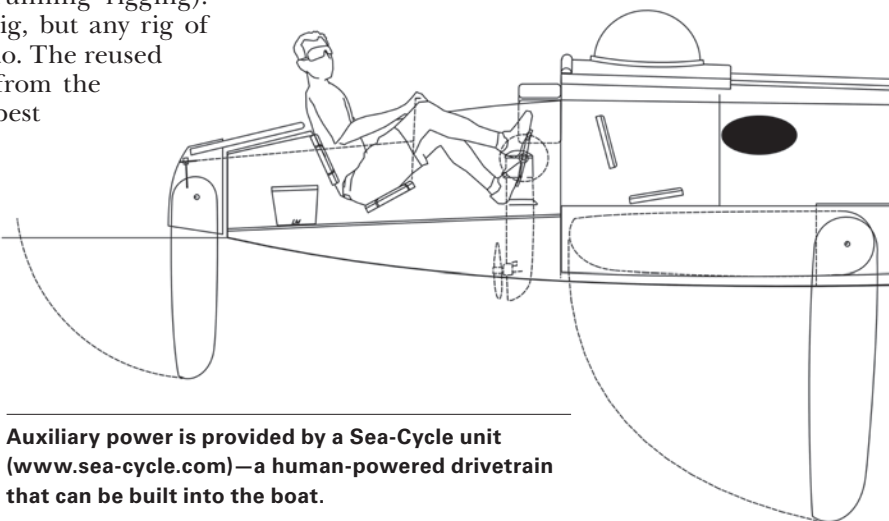
light and strong line tightened with “frapping turns” of line that tighten the slack in the loops. This is light, simple, and very tough, and avoids the point-loading of bolts. Unlashed, all the boat parts will store nicely on a trailer.

Propulsion

EUREKA is designed to use any suitable beach cat rig (mast, sails, boom, standing and running rigging). We’ve drawn her with a Hobie 16 rig, but any rig of approximately 220 sq ft (21 m²) will do. The reused rig removes a large chunk of time from the build process, and is certainly the best performance-per-dollar option. An asymmetric spinnaker flown from the hounds would be a desirable add-on, without adding too much stress to the rig.

For human-power mode, we have specified the pedal drive unit manufactured by Sea-Cycle. The unit is fixed to the starboard side with the pivot at its upper crank, or axle, allowing the unit to rotate up out of the water while sailing. There are two chain-and-sprocket

sets within the boat, to get the power of the pedaler to the drive unit, but it’s still lighter than an outboard motor, and removes the trouble of storing fuel aboard. In the lightest winds it may make sense to “motorsail”—that is, to pedal while sailing. This is especially true when sailing to windward, to augment the apparent wind. This could be very handy in busy harbors, to get around an island or point, or to outrace the boat next to



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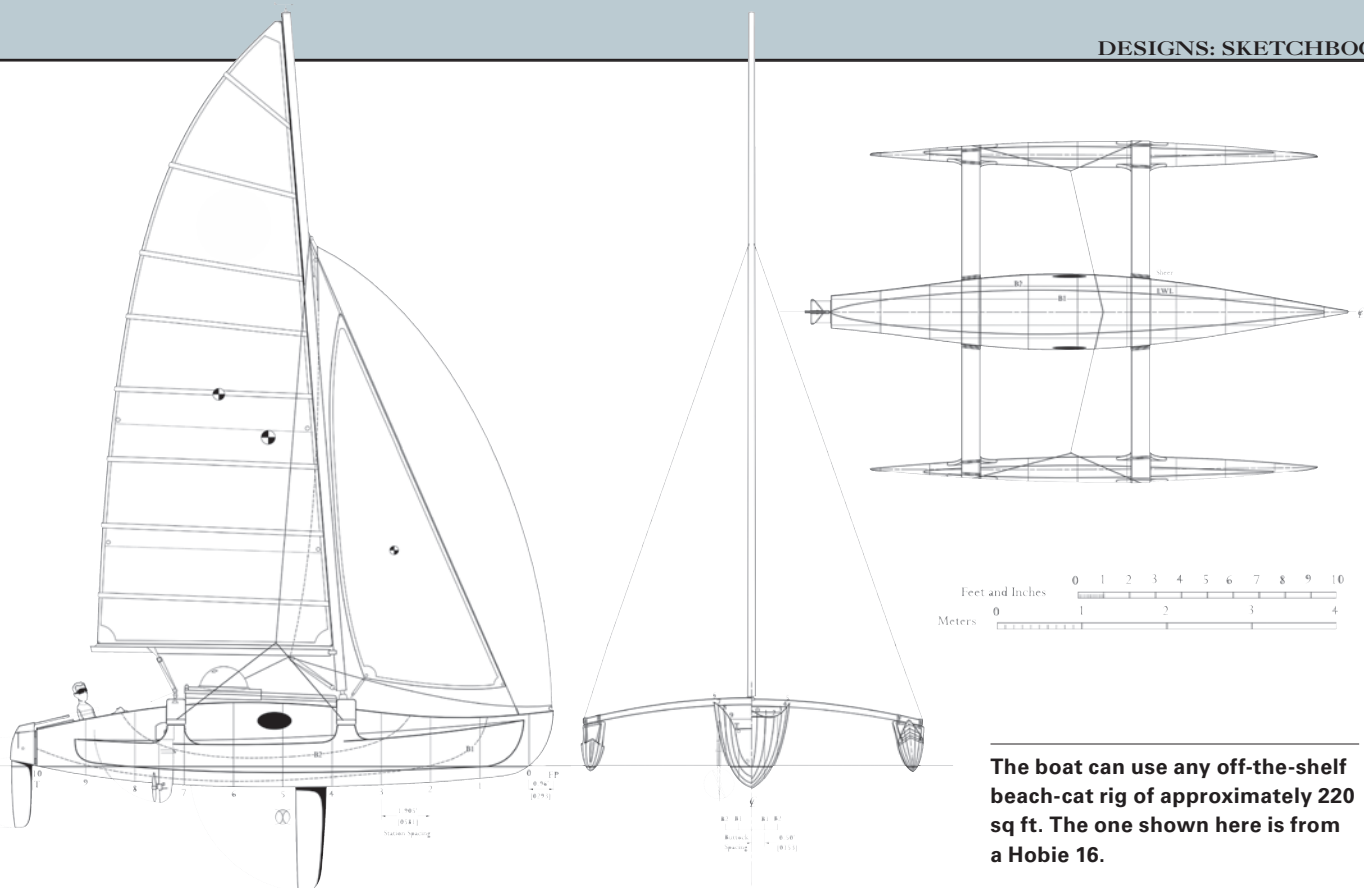


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The boat can use any off-the-shelf beach-cat rig of approximately 220 sq ft. The one shown here is from a Hobie 16.



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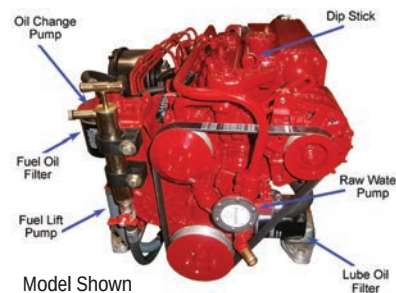
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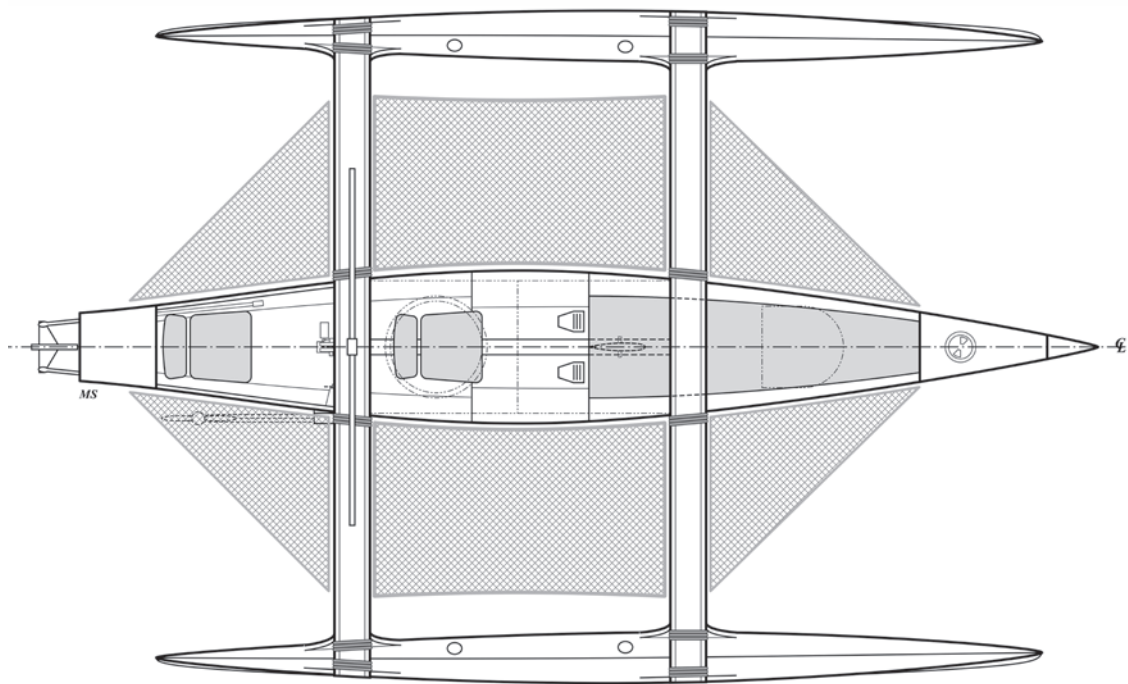
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The boat's three hulls—the vaka (main hull) and two amas (pontoons)—are lashed to the akas (crossbeams) with polypropylene. The boat is easily disassembled for transport.

you. Anyone who has rowed or paddled while sailing in light winds will know that this makes a big difference in speed, compared to sailing alone.

All lines lead to the aft cockpit, though the main and jib sheets may be led to the sliding hatch for sailing from inside. A small bimini top could be set up over the open hatch (with fiberglass rods to maintain the shape) to keep the rain out and sun off, while ensuring access to the sheets and halyards.

Modern racing trimarans are often designed with ama buoyancy equal to 200 percent of total displacement in order to maximize speed with less fear of driving the ama underwater and flipping the boat. The high volume is needed to fly both the windward ama and the vaka. However, given that EUREKA is a dual-purpose pedal-sail hybrid, and a cruiser first, we felt that a lower ama volume would be fine and offer less windage and weight while pedaling. Our compromise is 120-percent-buoyancy amas, which will still allow good sail-carrying ability and let you know when it's time to reef when the deck begins to submerge. To aid recovery from submerging too far, the ama decks are peaked in order to easily shed water. Typical beach cat rigs do not have reefpoints, but we strongly believe that any expedition-style small boat must be capable of reefing in a blow, and that whichever beach cat rig is chosen must be modified to include two reefs.

Food prep is bare-bones: A gimballed single burner in the cockpit would be safest, but might have to be set up in the cabin at times to make something hot during long bouts of bad weather. Easily accessed fire extinguishers near both hatches are a must. Water storage will be in jugs, and the sink is just a bowl.

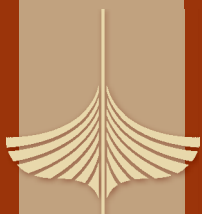
There is not a lot of storage, as a light trimaran such as this can't handle much extra weight, so string "sausages" are used along the interior sheerline, and you'll lash the spinnaker bag to the netting between the akas in order to free up space below.

A small Rocna anchor will be perfect for EUREKA, and it can be lashed aft of the forward aka, with the mooring line in a bag, ready for action. A stout cleat on the bow and stern is all that's needed for mooring or anchoring on a boat like this.

So, George, EUREKA is small and space is tight, but that's what you're expecting with a small trimaran such as this one. It's the pure sailing you're after: the gliding over the water at speed, the ability to pull the boat onto a beach for the night, to easily anchor in a beautiful bay when you want, or to safely ride out a storm if you need to. We hope she will give you the freedom and excitement you desire. 

Michael Schacht is an industrial designer with more than 25 years of experience in the commercial pleasure-boat industry. He lives in Port Townsend, Washington, and is best known for his conceptual design work, which may be viewed at www.proafire.com. Laurie McGowan is a boat designer in Nova Scotia with a diverse on- and below-water work history; he specializes in energy-efficient commercial and pleasure boats. More of his work may be found at www.mcgowanmarinedesign.com.

Do you have a boat concept you'd like to see Laurie McGowan and Michael Schacht develop on these pages? If so, send it to Sketchbook, WoodenBoat Publications, P.O. Box 78, Brooklin, ME 04616, or email it to sketchbook@woodenboat.com. Your letter should be no longer than 500 words.



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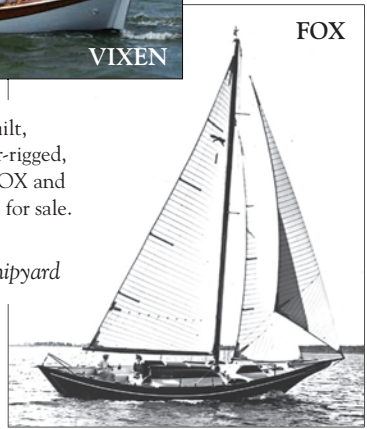
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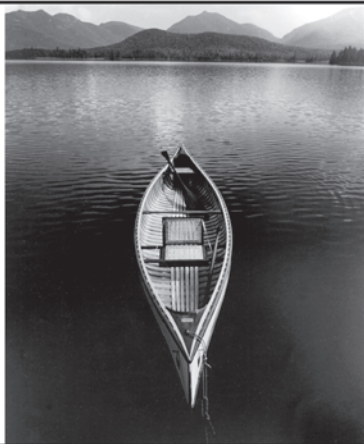
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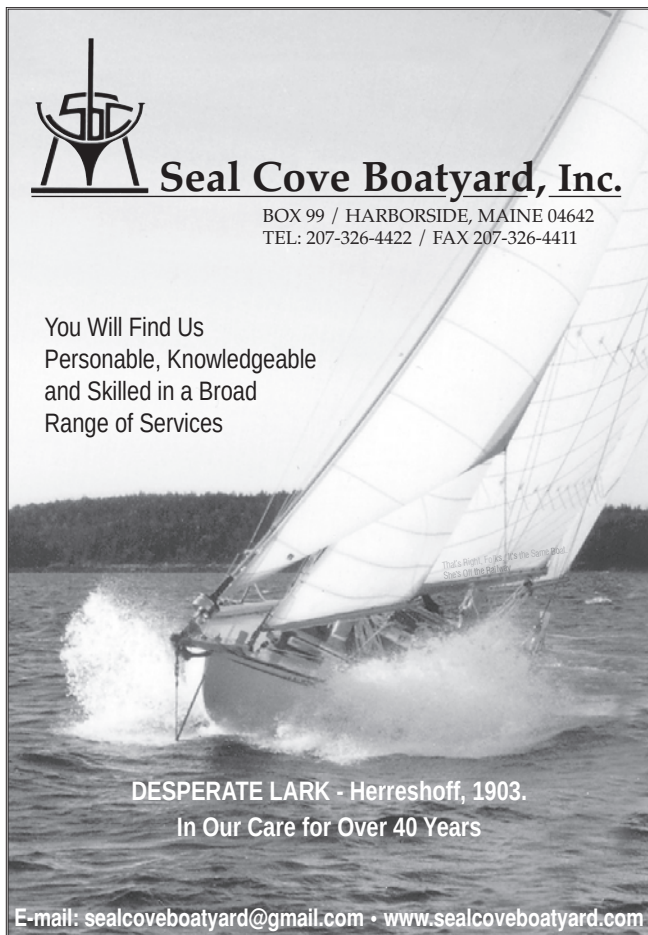
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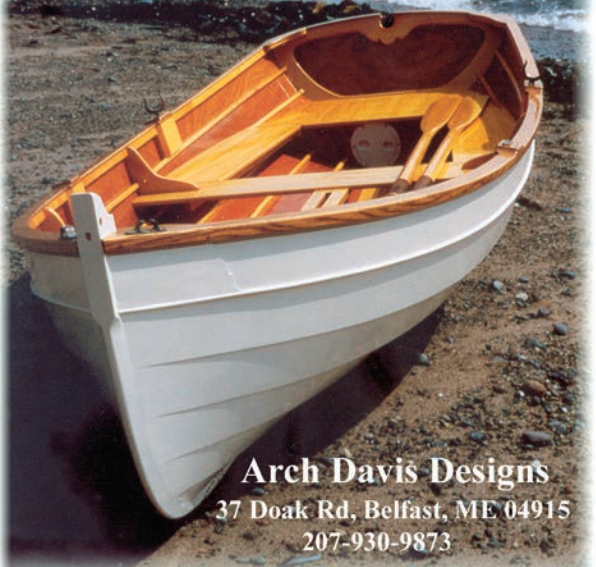
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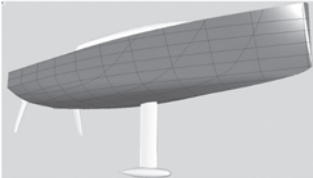
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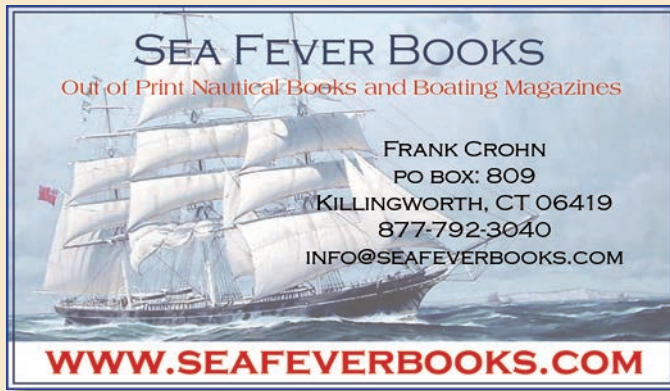


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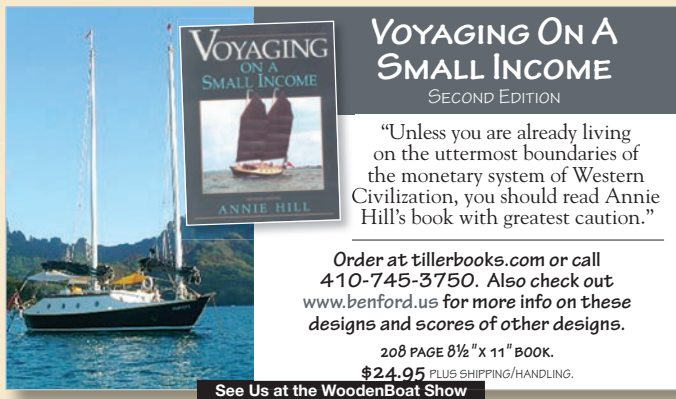
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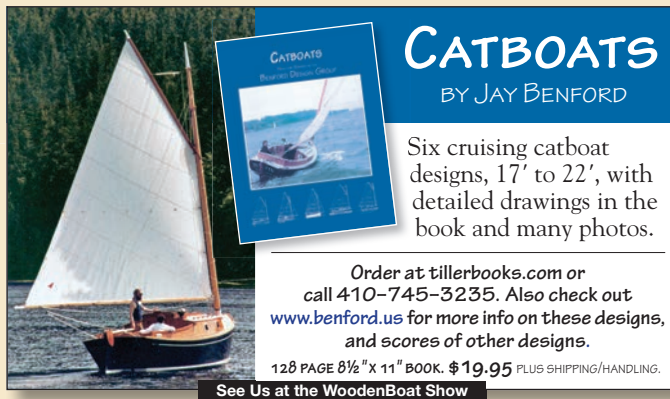
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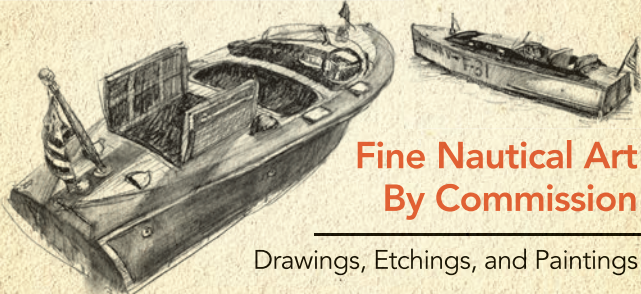
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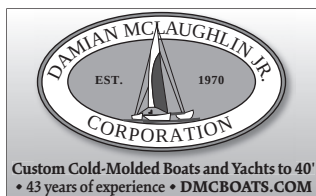
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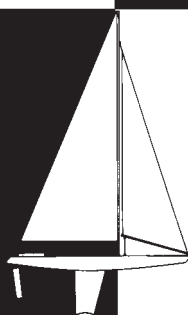


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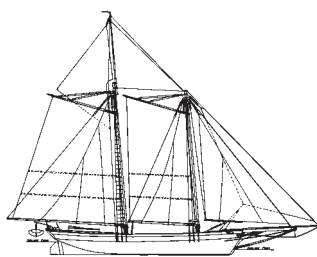
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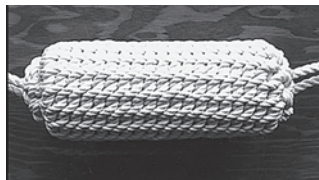
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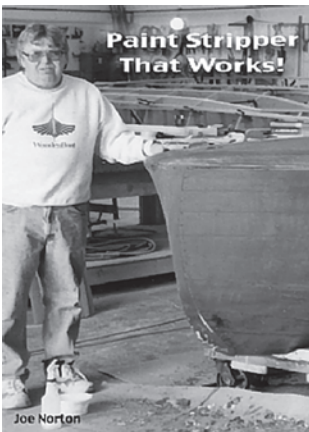
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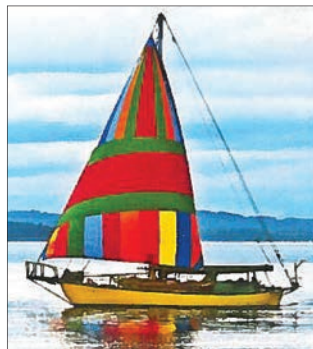
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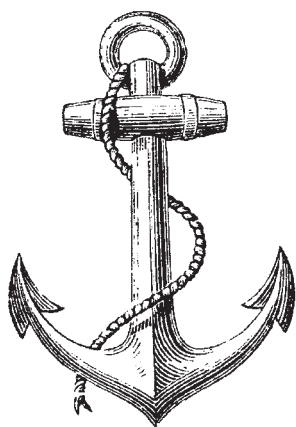
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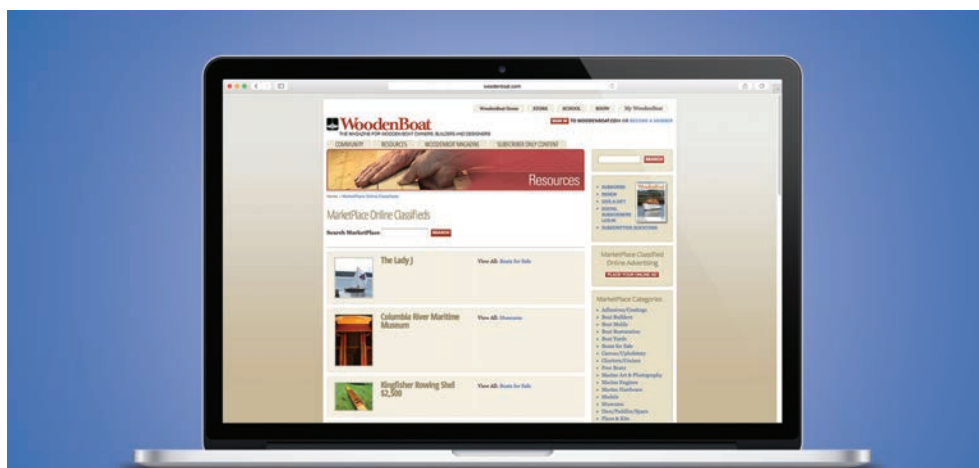
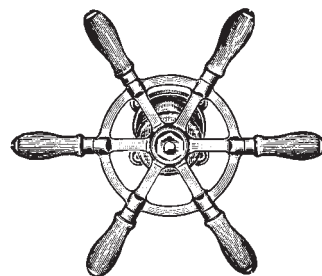
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HEART'S DELIGHT, ex-DELIGHT III *A Dutch-built Yawl*

Although her hull shape and rig are conventional for the 1930s era, this cruising yawl is unusual in how her Dutch builders constructed her hull. She was set up and planked around wide-spaced steel frames, afterwards having two steam-bent oak frames installed between them. Despite her foreign birth, the drawings from which she was built came from a New York-based designer and, upon completion, the boat spent her early years in Manhasset Bay, New York. Vivian Burnett used her often with friends and family, but sadly, in 1937, after rescuing the crew from another capsized boat, Burnett suffered a heart attack and died onboard.

The boat eventually migrated to New Orleans as ZEEVLAM. By 1993, her steel frames had pretty much rusted away, and her then owner covered her teak-planked hull with two diagonal layers of epoxied-on cypress veneers for strength and watertightness.

Her present owner further refurbished her and relaunched her in 2008. The builder's son and original owner's granddaughter attended that event. Since that celebration, however, HEART'S DELIGHT, although still afloat, has heavily weathered and is in need of serious refinishing. There may be more work required as well. On the plus side, her original hull was exceptionally well built, and was reinforced with the 1993 cold-molded overlay. Also, her deck of plywood and fiberglass has remained tight.

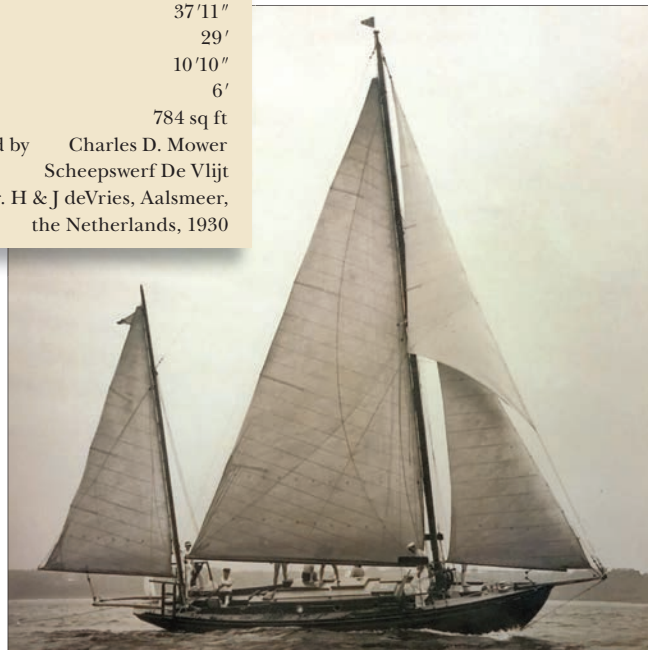
Her interior has been carefully redone to the point where a person could move aboard and live luxuriously. According to her owner, the rig is original, complete, and serviceable, even though the masts haven't been stepped this time around.

It's really amazing how little she's changed in 85



HEART'S DELIGHT

LOA	37'11"
LWL	29'
Beam	10'10"
Draft	6'
Sail area	784 sq ft
Designed by	Charles D. Mower
Built by	Scheepswerf De Vliet
	Gebr. H & J deVries, Aalsmeer, the Netherlands, 1930



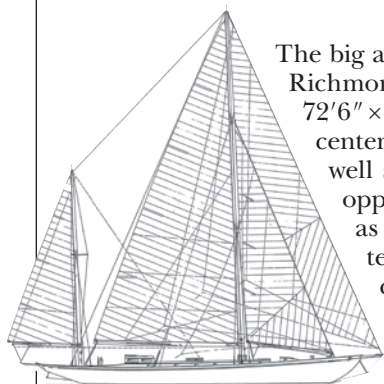
COURTESY OF WILL LEEPER (BOTH)

years: She still steers with a tiller, her deck layout and rig remain the same, and the interior still has its galley forward opposite the enclosed head. She sleeps six—two pipe berths forward, a pair of facing settee/berths in the main cabin, and a couple of quarter berths just aft of them on either side of the cockpit.

Good designer; great builder; unaltered from original. There's still a lot of boat here. But a Texas inland lake isn't the best environment for an aged wooden boat, so here's hoping she moves to a more temperate climate. For more information, contact owner Will Leeper, 214-808-9955 or will-ehs@swbell.net.

ESCAPADE Update

The big and once-lovely 1938 yawl ESCAPADE that I featured in WB No. 195 is still hauled out in Richmond, California, and her demolition isn't far off. As a reminder, this is the well-respected 72'6" x 17'1" ocean racer designed by P. L. Rhodes and built by Luders that, because she has a centerboard and is unusually wide, draws less water than others of her size. She's been pretty well stripped out, but most everything has been saved and would go with her. There's an opportunity here, after restoration, for competing with her old but newly restored rivals such as DORADE, STORMY WEATHER, and BOLERO. She'd be perfect for the Antigua or Mediterranean big-boat series, and would make a great yacht for chartering as well. If interested, contact owner Paul Kaplan at Keefe Kaplan Maritime Inc. (KKMI) at 510-307-7900. 🛡️



Maynard Bray is WoodenBoat's technical editor.

Send candidates for Save a Classic to Maynard Bray, WoodenBoat, P.O. Box 78, Brooklin, ME 04616.



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A special thank-you to the owners of *Moonmaiden II*. Beautiful paint job.

See Us at the WoodenBoat Show